

GWOU ADMINISTRATIVE RECORD
SECTION TITLE:
GW-200-202-1.09

DOCUMENT CONTROL SYSTEM - CORRESPONDENCE FILE

WELDON SPRING SITE REMEDIAL ACTION PROJECT
 MK-FERGUSON CO., INC. WO 3589 (314) 441-8086
 7295 Highway 94 South
 St. Charles, MO 63304

Document Number: 84062Document Type: TR-MKFB-MKFWOriginators DCN: 3840-C:GE-N05-4811-0SUBJECT GROUNDWATER OPERABLE UNIT SOIL SAMPLING REPORTAUTHOR DILLE, J.C.TO WESELY, MARJDATE 06/21/89SUBJECT CODE/WORK PACKAGE NUMBER 21 0010 476

REFERENCED DOCUMENT(S) _____

ACTION ITEM TRACKING

INITIATE ACTION ITEM

INDIVIDUAL ASSIGNED TO ACTION _____

DEPARTMENT _____

ACTION REQUIRED _____

DUE DATE 11

ACTION ITEM LOG NUMBER _____

CLOSE ACTION ITEM.

ACTION ITEM LOG NUMBER _____

INITIATING DOCUMENT DIN _____

COMPLETION DATE _____

APPROVAL _____

COMMENTS _____

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WSSRA PROJECT DOCUMENT TRANSMITTAL FORM

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|---|---|---|---|---|---|--|---|---|---|----------|---|--|---|----------------------|---|---------------------------|---|
| DOCUMENT NO. 3840-C:GE-N-05-4811-00 | W.P. NO. 476 | TASK NO. 852 | DATE 6/18/99 | | | | | | | | | | | | | | |
| TO: WSSRAP 7295 Highway 94 South St. Charles, Missouri 63304 (314) 441-8086 Attn: M. Wesely/R. Cato | | FROM: Engineering, Construction & Environmental Group P.O. Box 73 Boise, ID 83729 Attn: J. Carl Dille | | | | | | | | | | | | | | | |
| Recipient: Signature: Date Received: | ADDRESSEE: SIGN AND RETURN ONE COPY OF TRANSMITTAL TO: ENVIRONMENTAL SERVICES AT ABOVE ADDRESS WITHIN <u>5</u> WORKING DAYS | | <table border="1"> <tr> <td>APPROVED FOR CONSTRUCTION / FABRICATION</td> <td>A</td> </tr> <tr> <td>APPROVED AS NOTED - WORK MAY PROCEED, REVISE AND RESUBMIT</td> <td>B</td> </tr> <tr> <td>NOT APPROVED - WORK MAY NOT PROCEED, REVISE AND RESUBMIT</td> <td>C</td> </tr> <tr> <td>REJECTED</td> <td>D</td> </tr> <tr> <td>RECEIPT ACKNOWLEDGE APPROVAL NOT REQUIRED</td> <td>E</td> </tr> <tr> <td>FOR INFORMATION ONLY</td> <td>F</td> </tr> <tr> <td>APPROVAL ACTION REQUESTED</td> <td>G</td> </tr> </table> | APPROVED FOR CONSTRUCTION / FABRICATION | A | APPROVED AS NOTED - WORK MAY PROCEED, REVISE AND RESUBMIT | B | NOT APPROVED - WORK MAY NOT PROCEED, REVISE AND RESUBMIT | C | REJECTED | D | RECEIPT ACKNOWLEDGE APPROVAL NOT REQUIRED | E | FOR INFORMATION ONLY | F | APPROVAL ACTION REQUESTED | G |
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| DISTRIBUTION: * Transmittal Only cc: Task File P. Patchin K. Nanney * | REMARKS/INSTRUCTIONS: <p style="text-align: center;">N/A</p> |
| | Prepared By: Carol Montgomery <i>Carol Montgomery</i> |
| | Approved By: J. Carl Dille <i>Clm for J. Carl Dille</i> |
| | Title: Off-Site Design Manager |



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WSSRA PROJECT DOCUMENT TRANSMITTAL FORM

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| TO: WSSRAP 7295 Highway 94 South St. Charles, Missouri 63304 (314) 441-8086 Attn: M. Wesely/R. Cato | | FROM: Engineering, Construction & Environmental Group P.O. Box 73 Boise, ID 83729 Attn: J. Carl Dille | |
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| 3840TM-5031 3840-C:GE-K-05-4810 | 0 | 1 | Groundwater Operable Unit Soil Sampling Report | A |
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| | N/A |
| | Prepared By: Carol Montgomery <i>Carol Montgomery</i> |
| | Approved By: J. Carl Dille <i>clm for J. Carl Dille</i> |
| | Title: Off-Site Design Manager |

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Morris Knudsen Corporation
Engineers and Constructors Group

WSSRA PROJECT REVIEWS AND APPROVALS

W.P. NO. 476 TASK NO. 852 DOC. NO. 3840-C: GE-K-05-4810-00

W.P. TITLE: Quarry Restoration

QUALITY LEVEL 2

LEAD DISCIPLINE Geology

SUBJECT: WSSRAP - Groundwater Operable Unit
Soil Sampling Report
Report - Rev. 0
Technical Memorandum
No. 3840TM-5031-00

| | PRINT/TYPE NAME | SIGNATURE | DATE |
|------------------------------|--------------------|-----------------------|----------------|
| PREPARED: | <u>P. Patchin</u> | <u>Paul C Patchin</u> | <u>6/15/99</u> |
| REVIEWED: | <u>A. Benfer</u> | <u>Alan Benfer</u> | <u>6/15/99</u> |
| APPROVED MK E&C: | | | |
| - LEAD TASK ENGINEER | <u>P. Patchin</u> | <u>Paul C Patchin</u> | <u>6/15/99</u> |
| - LEAD DISCIPLINE DEPT. MGR. | <u>R. Raymondi</u> | <u>Rick Raymondi</u> | <u>6/15/99</u> |
| - DESIGN MANAGER | <u>J. C. Dille</u> | <u>John C Dille</u> | <u>6-16-99</u> |
| - ENGINEERING MANAGER | <u>M. Tavelli</u> | <u>Mike Tavelli</u> | <u>6/17/99</u> |
| APPROVED: | | | |
| - OFF-SITE QUALITY MANAGER | <u>M. Maier</u> | <u>My Maier</u> | <u>6/17/99</u> |

WELDON SPRING SITE REMEDIAL ACTION PROJECT

**WSSRAP GROUNDWATER OPERABLE UNIT (GWOU)
SOIL SAMPLING REPORT**

Task 852

Technical Memorandum No. 3840TM-5031-00

June 1999

Rev. 0

Prepared By

**Morrison Knudsen Corporation
Engineers and Constructors Group
720 Park Boulevard
Boise, ID 83729**

for

**MK-Ferguson Group
7295 Highway 94 South
St. Charles, MO 63304**

WSSRAP
Chemical Plant
Technical Memorandum No. 3840TM-5031-00
Task No. 852
GWOU Soil Sampling Report

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1.0 Introduction

This memorandum describes the soil sampling activities performed as part of the RI/FS process for the Groundwater Operable Unit at the WSSRAP. Field studies were conducted in the temporary storage area (TSA) from February 3rd through February 19th, 1999. During that period, thirty-two boreholes were drilled and sampled. The work was generally performed as described in the *Sampling Plan for the Remedial Investigation/Feasibility Study for the Groundwater Operable Unit at the Chemical Plant and Ordnance Works – Addendum 4: Soil Sampling for TCE at the Chemical Plant*, (MKF&JEG, 1999). As stated in the plan, the objectives of this investigation were to:

- Identify the source of PCE and TCE contamination to the shallow aquifer beneath the chemical plant
- Delineate the vertical and horizontal extent of PCE and TCE soil contamination if a source area is identified.

Geotechnology Inc. was subcontracted to perform all drilling, sampling, and borehole abandonment as part of Work Package 476, Task 15.

2.0 Environmental Safety and Health

The drilling was performed in accordance with the subcontractor's safe work plan under the authority of the PMC site health and safety plan. PMC safety representatives performed an initial safety inspection of the subcontractor's drill rig and provided coverage throughout the fieldwork. Work was performed in modified Level C personal protective equipment consisting of poly-coated Tyvek® coveralls, latex gloves, steel-toed boots, safety glasses, and hard hats. Non-drilling personnel wore fluorescent safety vests. No safety-related incidents or accidents occurred during this investigation.

ES&H personnel provided constant coverage during the fieldwork. All soil samples retrieved during drilling were scanned for beta and gamma activity before leaving the work area.

3.0 Waste Management

Soil cuttings generated from the drilling and sampling within the TSA fence were not collected because additional excavation of contaminated soil within the area was planned. Other waste generated during the drilling inside the TSA such as personal protective equipment was bagged and disposed of as radioactive trash. For those boreholes drilled outside the TSA fence, the cuttings were collected and contained in lined 55-gallon drums and transported to the Ash Pond area and emptied. All other waste generated outside the TSA was disposed of as clean waste.

4.0 Drilling and Sampling

A total of 32 boreholes were drilled in six areas of the temporary storage area (TSA). Four borings that were originally planned for the south end of raffinate pit 4 were not drilled following reevaluation of sampling data which showed PCBs in the area. It was determined that PCB decontamination requirements would significantly delay a subsurface investigation here, therefore, sampling was not conducted. Collection of samples from this area will likely be performed at a later date.

The investigation boreholes were drilled at locations shown in the *Sampling Plan* except where access to the original location was limited. In this case, the borehole was moved the minimum distance (less than 25 feet) from the original location. Figure 1 shows the final locations of the TCE soil sampling boreholes in the TSA vicinity. Monitoring wells and previous soil gas sampling locations are also shown. Table 4-1 below is a summary of the boreholes drilled during this program.

Table 4-1
Borehole Summary Table

| Borehole ID | Northing ¹ | Eastng ¹ | Ground Elevation ² | Total Depth (ft.) ³ |
|-------------|-----------------------|---------------------|-------------------------------|--------------------------------|
| TSA1-1 | 1042160.70 | 753592.60 | 666.56 | 49.0 |
| TSA1-2 | 1042132.60 | 753543.84 | 664.29 | 45.0 |
| TSA1-3 | 1042120.01 | 753456.60 | 665.56 | 48.5 |
| TSA1-4 | 1042078.35 | 753618.52 | 663.90 | 45.5 |
| TSA1-5 | 1042019.31 | 753455.53 | 659.02 | 33.0 |
| TSA1-6 | 1042043.73 | 753555.03 | 662.51 | 38.0 |
| TSA1-7 | 1041970.78 | 753568.11 | 661.84 | 39.5 |
| TSA1-8 | 1041899.53 | 753481.25 | 653.25 | 32.5 |
| TSA2-1 | 1041778.19 | 753479.33 | 654.15 | 26.5 |
| TSA2-2 | 1041732.92 | 753486.52 | 656.06 | 27.5 |
| TSA2-3 | 1041667.71 | 753480.84 | 656.27 | 34.0 |
| TSA2-4 | 1041619.59 | 753483.70 | 658.12 | 37.5 |
| TSA3-1 | 1041461.85 | 753480.41 | 656.11 | 30.0 |
| TSA3-2 | 1041481.03 | 753620.27 | 662.39 | 32.0 |
| TSA3-3 | 1041405.31 | 753555.52 | 665.00 | 42.5 |
| TSA3-4 | 1041328.06 | 753483.40 | 657.06 | 37.0 |
| TSA3-5 | 1041353.87 | 753646.26 | 665.63 | 31.5 |
| TSA3-6 | 1041262.41 | 753537.09 | 660.85 | 28.0 |
| TSA3-7 | 1041265.30 | 753645.58 | 664.54 | 37.0 |
| TSA3-8 | 1041321.03 | 753708.15 | 666.95 | 31.0 |
| TSA4-1 | 1041992.53 | 753941.03 | 664.25 | 45.5 |
| TSA4-2 | 1041937.33 | 753876.70 | 661.34 | 39.0 |
| TSA5-1 | 1041575.34 | 753828.02 | 660.53 | 28.5 |
| TSA5-2 | 1041471.95 | 753832.04 | 662.20 | 30.0 |
| TSA5-3 | 1041339.66 | 753831.92 | 666.26 | 35.0 |
| TSA5-4 | 1041255.53 | 753858.47 | 671.62 | 40.0 |
| TSA6-1 | 1041500.75 | 753936.36 | 665.39 | 35.5 |
| TSA6-2 | 1041449.67 | 753928.54 | 664.80 | 34.5 |
| TSA6-3 | 1041409.04 | 753933.60 | 664.25 | 35.5 |
| TSA6-4 | 1041399.07 | 753943.61 | 664.48 | 35.5 |
| TSA6-5 | 1041322.18 | 753933.63 | 666.59 | 28.0 ⁴ |
| TSA6-6 | 1041316.97 | 753934.44 | 667.15 | 36.0 |

¹ NAD 1983 survey datum.

² In feet above sea level.

³ Total depth at the top of bedrock.

⁴ Total depth above bedrock because of stuck sampler.

Two drilling rigs were used to expedite the investigation. A truck-mounted CME-75 was initially used to drill and sample the boreholes. It was joined by an all-terrain CME-550 drill rig. Hollow stem augers with an inside diameter (ID) of 4-1/4-inches and outside diameter (OD) of 8-1/4-inches were used on both rigs. Soil samples were collected continuously throughout each borehole using a CME continuous soil sampler with an ID of 3 inches.

Soils were retrieved from the sampler and divided into 2-1/2-foot samples. Each section was split lengthwise and approximately one-quarter of the sample was immediately placed and sealed in a plastic bag and the remaining three-quarters was described by the PMC geologist according to

the Unified Soil Classification System and ES&H procedure 4.4.7. The bagged samples were later screened for volatile organic compounds in the headspace as described in Section 4.1.

All boreholes except one were advanced to the top of bedrock to characterize and sample the overburden soil. Borehole TSA6-5 was terminated at 28 ft. because the CME-sampler became stuck in the augers. After repeated attempts to remove the sampler, the augers were withdrawn from the hole, the sampler retrieved, and the hole was abandoned by grouting. Borehole TSA3-3 had to be re-drilled a few feet away from the original location after poor sample recoveries were caused by a wood piece plugging the auger bit. The re-drilled hole successfully reached bedrock with good sample recoveries.

4.1 Headspace and Laboratory Sampling

Headspace screening for volatile organic compounds was conducted on each 2-½ ft. soil sample collected during this investigation. A photoionization detector (PID) with a lamp suitable for ionizing the compounds TCE and PCE was used during the headspace screening. Results from this screening will be published in an upcoming completion report.

The *Sampling Plan* stated that those samples registering at least five times the levels measured in the atmosphere during PID screening would be selected for laboratory analysis. No sample obtained during the field effort registered this high. Therefore, those samples with any noticeably higher reading than background were selected for laboratory analysis. If headspace screening showed no samples greater than background, the top 5 feet of soil from the borehole was sent for laboratory analysis. Sampled intervals and results from headspace screening and laboratory analysis will be published in the completion report.

4.2 Borehole Abandonment

Each borehole was abandoned according to the work package specifications and Missouri well construction rules. When drilling was completed, a tremie pipe was placed to the bottom of the hole and the borehole was grouted to the surface using Grout Well® high solids bentonite grout. Each borehole was checked for grout settlement and topped off as necessary.

5.0 Data Analysis

5.1 Soils

Soils sampled during the drilling effort were relatively consistent across the TSA. Recent fill material related to the construction of the TSA was encountered in a majority of the boreholes ranging up to 13 ft. deep. The thickest areas of recent fill were seen in Area 1. The recent fill was characterized primarily as re-worked Ferrelview Formation clay with its distinctive high plasticity and mottled colors. Pre-TSA fill material placed during the construction of the chemical plant was also encountered in most of the areas, sometimes beneath the recent fill. It

ranged in thickness up to 6 ft. and was distinguishable as a dark colored, low plasticity, siltier material.

The native soil stratigraphy in the chemical plant area is described in detail in the *GWOU Remedial Investigation Report* (MKF-JEG, 1997). Native soils encountered beneath the fill were consistent with previous drilling in this area of the Chemical Plant. The Ferrelview Formation, a high plasticity clay, was commonly found beneath the fill or at the ground surface at thickness' from 8 to 21.5 feet. In a few areas, the Roxana Silt, which overlies the Ferrelview, was described and where identified, it ranged in thickness from 2 to 9 feet. Below the Ferrelview Formation was the clay till unit, which ranged in thickness from 7 to 21.5 feet. A subunit of the clay till, the basal till was described in a two of the boreholes. Beneath the clay till and directly above the bedrock surface, the residuum unit was usually encountered prior to auger refusal on the bedrock, however, some boreholes showed no discernable residuum soil. Overall, this unit was generally thin in comparison with other areas on the site, ranging in thickness from 1.5 to 10.5 feet.

5.2 Bedrock

The weathered surface of the Burlington-Keokuk Limestone was encountered in the majority of the boreholes drilled in the TSA area. Auger and sampler refusal generally indicated that the bedrock surface had been intercepted. However, because of the cobble and boulder-sized rock fragments commonly found at the base of the clay till unit or within the residuum overlying the bedrock, sampler refusal did not always indicate the top of the bedrock. In some cases, an SPT sampler was driven to confirm the top of bedrock.

Figure 2 shows the bedrock topography after incorporating borehole data from the TSA area and recent drilling performed within Raffinate Pit #3. The most notable effect when compared to previous mapping is the greater definition on the bedrock surface in the TSA area. No significant changes to the overall morphology of the bedrock are noted.

6.0 References

- MK-Ferguson Company and Jacobs Engineering Group. *Sampling Plan for the Remedial Investigation/Feasibility Study for the Groundwater Operable Unit at the Chemical Plant and Ordnance Works - Addendum 4: Soil Sampling for TCE at the Chemical Plant*, DOE/OR/21548-445: 4, Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. January, 1999.
- MK-Ferguson Company and Jacobs Engineering Group. *Remedial Investigation for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri*, DOE/OR/21548-571 (Final), Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July, 1997.

84089

ATTACHMENTS - BOREHOLE LOGS



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

WP-476, TASK 15

Hole Number

TSA-1-1

| | | | |
|--|---------------------------------|---|-------------------------------------|
| Project: TCE SOURCE INVESTIGATION | | Location: NW CORNER OF TSA | |
| Coordinates: 1042160.7 N 753592.6 E | | Drilling Contractor: GEO TECHNOLOGY | |
| Drill Make and Model: CME-55 ATV MOUNT | | Depth Top of Rock: ~ 49 | Depth Casing & Size: NA |
| Elevation: 666.56' | | Angle from Vert. and Bearing: VERTICAL (0°) | Depth Bottom of Hole: 49' |
| Water Level: NA | Fluid & Additives: NA | Date Start: 2/11/99 | Date Finish: 2/11/99 |
| | | Logger: N. BOSS | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-8"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 1930 | 0 | 0 | CME-1 | 4/4 | NA | CL | 0-2.5') silty CLAY; mot rd brn & lt. gray; high plas; little silt; some clay; tr. d. gly; field sand; v. stiff; tr. subang. fresh, ls gravel; damp; reworked; no odor; MnOx stain; FeOx nodules; [Framed view Feil] |
| | 4 | 4 | | | | OL | 2.5-5.0') silty CLAY; blk; st-med plas; little silt; some clay; tr. subang ls gravel road base; damp; organic odor; roots; reworked (compacted); firm [Remant Topsoil (Framed)] |
| 1950 | 5 | 4 | CME-2 | 5/5 | NA | CL | 5-7.5') see 0-2.5' for description |
| | 9 | 9 | | | | DL | 7.5-8.5') silty CLAY; blk; st-med plas; little silt; some clay; tr. subang fly sand; damp; organic odor; roots; native; not reworked; firm [Remant Native Topsoil] |
| 209 | 10 | 9 | CME-3 | 5/5 | NA | ML | 8.5-10.5') clayey silt; rd brn; sl plas; little clay; mostly silt; tr. sand; damp-silt; no odor; FeOx stain; loose; firm [Roxana Silt] |
| | 14 | 14 | | | | CH | 10.5-22') CLAY; mottled rd brn & lt. gray; high plas; tr. silt; some clay; tr. subang gly; field sand; v. stiff; damp; no odor; MnOx stain; FeOx nodules |
| 209 | 15 | 14 | CME-4 | 5/5 | NA | CH | |
| | 19 | 19 | | | | CH | |
| 209 | 20 | 19 | CME-5 | 5/5 | NA | CH | |
| | 24 | 24 | | | | CH | |
| 209 | 24 | 24 | CME-6 | 5/5 | NA | CH | |
| | 25 | 25 | | | | CH | See pg. 2 for description [CLAY TILL] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, TASK 15

Hole Number
TSA-1-1

Project: TLE SOURCE INVESTIGATION

Location: NW CORNER OF TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | | | | | | |
| 25 | | 24 | CME-6 | 5/5 | NA | CL | (22-45) Silty CLAY; rd brn; med plas; some silt; some clay; little vt, gty; feld, subang sand; tr. highly weathered granitic, abs; stiff; damp; no odor; MnOx stain |
| | | 29 | | | | | |
| 30 | | 29 | CME-7 | 5/5 | NA | | |
| | | 34 | | | | | |
| 35 | | 34 | CME-8 | 5/5 | NA | GC | [CLAY TILE] (45-49) Clayey GRAVEL; white - H gray chert; ls gravel (max size 3"); little v. plas lins; clay matrix = rd brn; v. dense; damp; P. sorted; subang - subround gravel appear med weathered - 47-49 no gravel present, clay is v. high plas white-H gray (residual) |
| | | 39 | | | | | |
| 40 | | 39 | CME-9 | 2/5 | NO REC FROM 42-44' | | |
| | | 44 | | | | | |
| 45 | | 44 | CME-10 | 5/5 | NA | GC | |
| | | 49 | | | | | |
| 50 | | | | | | | Boring terminated @ 49' bgs, due to auger; sampler refusal upon incompetent bed rock. Boring backfilled w/ ben lime slurry. Samples collected in 1-gal Ziploc @ 2.5' intervals as composites for PID headspace analysis. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
NP-476, Task 15

Hole Number
TSA-1-2

Project:
TCE Source Investigation

Location:
NW CORNER OF TSA

Coordinates:
1042132.60 N 753543.04 E

Drilling Contractor:
GEDTECHNOLOGY

Drill Make and Model:
CME-55 ATV MOUNT

Depth Top of Rock:
~ 45'

Depth Casing & Size:
NA

Hole Size:
8.5"

Elevation:
664.29

Angle from Vert. and Bearing:
VERTICAL (0°)

Depth Bottom of Hole:
45'

Water Level:
NA

Fluid & Additives:
NA

Date Start:
2/11/99

Date Finish:
2/11/99

Logger:
N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | 0 | CME-1 | 4/4 | NA | CL | 10-11) Silty CLAY; mottled rd brn; Hgray; high plas; little silt; some clay; tr. vt-m fly sand; tr. little subang fresh gravel; damp; stiff-v. stiff; reworked; no odor; MnOx stain; FeOx nodules; smear |
| 5 | 4 | 4 | CME-2 | 5/5 | NA | | |
| 10 | 9 | 9 | CME-3 | 5/5 | NA | | [Ferrel view Fill] |
| 15 | 14 | 14 | CME-4 | 5/5 | NA | CH | (11-20) CLAY; mottled rd brn; Hgray; high plas; tr. silt; some clay; tr. vt subang fly sand; v. stiff; damp; tr. granite pebs (weathered); no odor; MnOx stain; FeOx nodules; decrease in FeOx w/ depth -15-20', clay is predom. Hgray w/ tr. FeOx stain |
| 20 | 19 | 19 | CME-5 | 5/5 | NA | CL | [NATIVE Ferrel view] |
| 25 | 24 | 24 | CME-6 | 5/5 | NA | | (16-32) Silty CLAY; rd brn; med plas; some silt; some clay; little vt, fly subang sand; tr. high weathered granite pebs; stiff; damp; no odor; abundant MnOx stain |
| 26 | 29 | 29 | CME-7 | 5/5 | NA | | [CLAY TILL] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, TASK 15

Hole Number
TSA-1-2

Project: TLE Source Investigation

Location: NW CORNER OF TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 1516 | 25 | 24 | CME-6 | 5/5 | NA | CL | See pg 1 for description |
| | | 29 | | | | | |
| 30 | 30 | 29 | CME-7 | 5/5 | NA | | |
| | | 34 | | | | | |
| 528 | 35 | 34 | CME-8 | 5/5 | NA | GC | [CLAY TILL] (40-42.5) Clayey GRAVEL; H gray gravel; yel br matrix; some v. plas fines (clay, silt); little subang cherty sands; dense; damp-moist; p. sorted; p. bound; no odor [Basal Till?] (42.5-45) Clayey GRAVEL; white - H gray gravel, 6 rd matrix; little plas fines (clay); gravel is chert & mod weathered ls up to 3" max; v. dense; damp; p. sorted; no odor [Residuum] |
| | | 39 | | | | | |
| 550 | 40 | 39 | CME-9 | 5/5 | NA | | |
| | | 44 | | | | | |
| 1608 | 45 | 44-45 | 95-1 | 1/1 | NA | | Boring terminated @ 45' bgs due to sampler / auger refusal upon impenetrable Residuum. Boring backfilled w/ bentonite slurry upon completion. - Samples were collected in 1-gal Ziploc @ 2.5' intervals as composites for PID headspace analysis |
| | 50 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sampler - 3.0" I.D. CME continuous

Sheet 1 of 2

Project Number:

Task B52

Hole Number

TSA-1-3

| | | | | | | | |
|-----------------------|--------------------------|--|--|-------------------------------|----------------------------------|--|-----------------------|
| Project: | TCE at the Chem. Plant | | | Location: | inside TSA, NW, offset hole ~12' | | |
| Coordinates: | 1041937.33 N 753456.60 E | | | Drilling Contractor: | Geo technology | | |
| Drill Make and Model: | CME-TS, H.S. auger | | | Depth Top of Rock: | 48.5' | | Hole Size: |
| Elevation: | 665.56' | | | Angle from Vert. and Bearing: | Vertical | | Depth Bottom of Hole: |
| Water Level: | - | | | Fluid & Additives: | None | | Date Start: |
| | | | | | | | Date Finish: |
| | | | | | | | Logger: |
| | | | | | | | A. Berfer |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------|----------|--------------------|-----------------------------------|--------------|--|
| | | INTERVAL | 3.0" TYPE & NUMBER | | | |
| | | | | 8"-6"-6" (IN) | | Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
| | | 0 | CME 1 | 50' | | Lean clay (CL) - orange brown, with FeO nodules, moist, stiff, reworked Ferraluvium clay. at 1.5' - olive gray and brown, with some gravel. FILL |
| 5 | 5.0 | 5.0 | CME 2 | 5.0' | | Fill as above. |
| 10 | 10.0 | 10.0 | CME 3 | 5.0' | | Lean clay (CL) mostly light brown, with FeO nodules, moist, v. stiff - reworked Ferraluvium - FILL |
| 15 | 15.0 | 15.0 | CME 4 | 5.0' | | Lean clay (CL), mottled light brown and gray, abundant FeO nodules, moist - stiff. (Roxanna-like) Ferraluvium |
| 20 | 20.0 | 20.0 | CME 5 | 5.0' | | Fat clay (CH) orange brown with light gray streaks (appear to follow paleo fractures), scattered FeO nodules, moist, v. stiff, slickensided, massive Ferraluvium |
| 25 | 25.0 | | | | | Trace of sand |
| | | | | | | Fat clay (CH) ~ 20% sand, ~ 5% fine gravel, mottled yellow brown, with light gray and black (MnO). Moist, v. stiff. CLAY TILL |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task 852

Hole Number

TSA-1-3

Project:

ICE at the Chem. Plant

Location:

inside TSA, NW

SOIL DESCRIPTION

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0925 | 25.0 | | CME 6 | 5.0' | | | Fat clay (CH) ~ 20% sand, trace of fine gravel, minor FeO nodules, predominantly yellow brown with streaks of light gray and black, both appear to follow fractures, damp to moist, v. stiff. CLAY TILL |
| 30 | 30.0 20.0 | | CME 7 | 5.0' | | | ✓ as above, scattered gravel ~ 5% fine to up to 1", light gray does follow fractures (mostly healed), black also follows fractures (open) but also as nodules. at 33-35' - yellow brown only |
| 35 | 35.0 35.0 | | CME 8 | 5.0' | | | CH as above, gravel pockets of chert up to 2", clean fine sand lens at 37.5' (3") light gray and black coating fractures. |
| 40 | 40.0 40.0 | | CME 9 | 4.0' | | | Lean clay, silty, light gray with orange brown FeO blebs, blocky texture, moist, stiff. CLAY TILL |
| 45 | 45.0 45.0 | | CME 10 | 3 1/2' | | | Clayey gravel (GC), angular chert with plastic clay matrix, orange brown, moist, dense, at 47' 3" seam of high plastic clay |
| 1010 | 48.5 | | SPT | | 25/24 | | Residual |
| 50 | | | | | | | T.O. 48.5' 1020, on Limestone, 2/11/99 Hole back filled with Groot Well bentonite slurry |



Sheet 1 of 2

Project Number:

Task 852

Node Number

TSA-1-4

BOREHOLE LOG

3.0" I.D. CASE Continuous Sampler

Project:

Project: TCE at the Chem Plant

Location:

inside TSA. NW

Coordinator:

1042078.35N 753618.52E

Drilling Contractor

Geotechno/094

Drill Make and Model:

CME-75 H.S. Auger

Depth Top of Flock:

45.5'

Depth Casing & Size

உதாரணம்:

Hold Size:

4 1/4" / 8 1/4"

Elevations

663.80

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

45.5

Water Level:

Fluid & Additives:

FILED & Adminstr:
11/17/14

Date Start: 7535

2/10/99

Date Finish: 11-16-85

DATE FILED: 10-4-2
2/11/00

Figure 1

Logg *Ben L.*

SOL. DESCRIPTION

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | | | | | | |
| | 0 | | CME 1 | 5.0' | | | Lean clay, brown to dark brown, abundant FeO nodules, moist, stiff. Reworked Ferrelview Clay 5-6', old topsoil |
| 5 | 5.0 5.0 | | CME 2 | 5.0' | | | FILL 6.0' Lean silty clay mottled orange brown and dark gray, abundant FeO nodules, moist, stiff. Ferrelview Clay at 8', mostly light brown. (Roxanna-like) |
| 10 | 10.0 10.0 | | CME 3 | 5.0' | | | 11' Fat clay (CH) mostly orange brn, moist light gray, some FeO nodules, massive highly plastic, moist stiff, slickensided at 13', mostly light gray. |
| 15 | 15.0 15.0 | | CME 4 | 5.0' | | | CH as above |
| 20 | 20.0 20.0 | | CME 5 | 5.0' | | | 18.5' Fat clay, (CH), ~10% sand, some fine gravel, mottled yellow-orange brown, light gray with black streaks (MnO), moist, or stiff, CLAY TILL at 21', ~20% sand, 10% fine grvt., orange brown to brown with light gray, MnO nodules and streaks, larger gravel at 24', CLAY TILL |
| 25 | 25.0 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

84062
Sheet 2 of 2
Project Number:
Task 852
Hole Number:
TSA-1-4

Project: T&E at the Chem Plant

Location: Inside TSA, NW

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 25.0 | | CME 6 | 5.0 | | | Fat clay (CH) yellow brown, ~20% sand, ~10% gravel, streaks of MnO, Moist, V. stiff. CLAY TILL at 29' increase in gravel |
| 30 | 30.0 | | CME 7 | 5.0 | | | As above, light gray and black tend to follow fractures, damp - |
| 35 | 35.0 | | CME 8 | 5.0 | | | as above to 36.5. at 36.5 - 37.5, heavy gravel zone - 37.5 - 39.0', light brown. Very silty clay - |
| 40 | 40.0 | | CME 9 | 4.0 | | | Clayey Gravel (GC) angular chart, red-dish brown to brown high plastic clay matrix, Moist, dense. Residual |
| 45 | 45.0 | | | | | | T.D. 45.5, probably bed-rock, 1645 2/10/99. Hole backfilled with GROUT Well bentonite slurry. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

WP-476, Twp 15

Hole Number

TSA-1-5

Project: TCE SOURCE INVESTIGATION

Location: NW CORNER OF TSA (OUTSIDE FENCE)

Coordinates: 1042019.31N 753455.53E

Drilling Contractor: GEDTELHOLDING

Drill Make and Model: CME-55 ATV-MOUNT

Depth Top of Rock: ~ 33'

Depth Casing & Size: NA

Hole Size: 8.5"

Elevation: 659.02

Angle from Vert. and Bearing: VERTICAL (0°)

Depth Bottom of Hole: 33'

Water Level: NA

Fluid & Additives: NA

Date Start: 2/19/99

Date Finish: 2/19/99

Logger: N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | | | | | |
| | 35 | | CME-1 | 35/35 | NA | FILL | (0-8) silty CLAY; mottled rd brn; H. gray; high plas; little silt; some clay; tr. vt-m gty sand; tr. little subang fresh gravel; damp; stiff-v. stiff; (reworked); no odor; MnOx stain; FeOx nodes (smeared) |
| 5 | 35 | | CME-2 | 5/5 | NA | (CL) | [FERREVIEW FILL] |
| | 8.5 | | | | | OL | (8-8.5) silty CLAY; blk; sl-med plas; little silt; some clay; damp; firm; wgy odor; tr. sand; roots |
| 10 | 8.5 | | CME-3 | 5/5 | NA | | [Cement Topsoil] |
| | 13.5 | | | | | CH | (8.5-16) CLAY; mottled rd brn; H. gray; high plas; tr. silt; mostly clay; tr. vt-med gty sand; tr. granitic (v. weathered) pbs; v. stiff; damp; slickensided; no odor; MnOx stain; abundant FeOx nodes |
| 15 | 13.5 | | CME-4 | 5/5 | NA | | [Ferrel view] |
| | 18.5 | | | | | | (16-29) Silty CLAY; rd brn; med plas; some silt; some clay; little vt gty; subang sand; tr. high weathered granitic pbs; abundant MnOx stain; no odor; v. stiff |
| 20 | 18.5 | | CME-5 | 5/5 | NA | CL | |
| | 23.5 | | | | | | |
| | 28.5 | | | | | | |
| 25 | 28.5 | | CME-6 | 5/5 | NA | | - > get content w/ depth |
| | 28.5 | | | | | | [CLAY TILE] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

WP-476, Task 15

Hole Number

TBA-1-5

Project:

TCE SOURCE INVESTIGATION

Location:

NW CORNER OF TBA (OUTSIDE FENCE)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 8"-6"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | 23.5 | | ONE-2 | 5/5 | NA | CL | (See pg. 1 for description) |
| | 28.5 | | | | | | [CLAY FILL] |
| | 28.5 | | | | | | |
| 30 | | | ONE-7 | 45 / 4.5 | NA | GC | (29-33) Clayey GRAVEL; white; H. gray subround gravel; red clay matrix; little v. plus fines; v. dense; granular chert; ls up to 3" max; damp; p. sorted; gravel mod weathered; no odor [Randomness] |
| | 33 | | | | | | |
| 35 | | | | | | | Boring terminated @ 33' bgs due to auger / sampler refusal upon impenetrable bedrock |
| | | | | | | | Boring backfilled w/ bentonite slurry upon completion |
| 40 | | | | | | | Samples collected in 1 gal 2g/100 @ 2.5' intervals as composites for PID roadside analysis. |
| 45 | | | | | | | |
| 50 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
WP-470, T-415

Hole Number:
TSA-1-6

Project:
TLE SOURCE INVESTIGATION

Location:
NW CORNER OF TSA

Coordinates:
1042043.73 N 753555.03E

Drilling Contractor:
GEOTECHNOLOGY

Drill Make and Model:
CME-55 ATV MOUNT

Depth Top of Rock:
NA

Depth Casing & Size:
NA

Hole Size:
8.5"

Elevation:
662.51

Angle from Vert. and Bearing:
VERTICAL (0°)

Depth Bottom of Hole:
38' bgs

Water Level:
NA

Fluid & Additives:
NA

Date Start:
2/10/99

Date Finish:
2/10/99

Logger:
N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | CME-1 | 3/3 | NA | CL | (0-65) Silty CLAY; mottled rd brn; H. gry; high plas; little silt; some clay; tr. vf-m gy sand; tr. little subang fragm to gravel; damp; reworked; compressed; no odor; Mn Ox stain; Fe Ox nodules [Ferrelview Fill] |
| 5 | 3 | | CME-2 | 5/5 | | OL | (5-65) Silty CLAY; blk; sl-med plas; little silt; some clay; tr. subang to gravel road base; damp; organic odor; roots [Remnant Topsoil] |
| 10 | 8 | | CME-3 | 5/5 | | CH | (65-16) CLAY; mottled rd brn; H. gry; high plas; trace silt; some clay; tr. vf subang gy sand; v. stiff; damp-dry; no odor; Mn Ox stain; Fe Ox nodules; [Native Ferrelview] |
| 15 | 13 | | CME-4 | 5/5 | | | -> sold to 25% L ₉₀ 8-11' bgs |
| 20 | 18 | | CME-5 | 5/5 | | CL | (16-32) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, gy, subang sand; tr. ngn weathering granitic frags; stiff; damp; no odor; Mn Ox stain [CLAY TILL] -> sand; < sold water - from 20-22 (Sandy S.H.) |
| 25 | 23 | | CME-6 | 5/5 | | | |
| | 25 | | CME-7 | 5/5 | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

WP-476, Task 15

Hole Number

TSA-1-C

Project:

TCE SOURCE INVESTIGATION

Location:

NW Corner of TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | | 23 | ONE-2 | 5/5 | NA | | See pg 1 for description |
| | | 28 | | | | | |
| | | 28 | | | | | |
| 30 | | | | | | | |
| | | 33 | ONE-1 | 5/5 | NA | | |
| | | 23 | | | | | |
| 35 | | | ONE-B | 5/5 | NA | CL | (325-36) Silty CLAY; lt. gray; med-high plastic; some silty; some clay; stiff; laminated; dry; no odor; Fe Ox stain tr. granitic pebbles [Boreal Till] |
| | | 38 | | | | GL | (36-38) Clayey GRAVEL; white chert & 1/5 gravel (up to 3"); little fine sand; clay matrix is reddish; v. dense; damp; p. sorted; gravel = weathered [Residual] |
| 40 | | | | | | | Boring terminated @ 38' deep due to sampler/angel refusal upon impervious Residual. Boring back-filled w/ bentonite slurry. |
| 45 | | | | | | | - Samples collected in 1 gal Ziploc @ 25' intervals as composite for onsite PID head SPRUE SCREENING |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

BOREHOLE LOG

Sheet 1 of 2

Project Number:
Task 852

Hole Number:
TSA-1-7

Project:
TCE at the Chem. Plant

Location:
Inside TSA - NW

Coordinates:
1041970.78N 753568.11E

Drilling Contractor:
Geotechnology

Drill Make and Model:
CME-75, H.S. Auger

Depth Top of Rock:
30'

Depth Casing & Size:
—

Hole Size:
4 1/4" / 8 1/4"

Elevation:
66.84

Angle from Vert. and Bearing:
Vertical

Depth Bottom of Hole:
39.5'

Water Level:
—

Fluid & Additives:
—

Date Start:
10/15/99

Date Finish:
10/16/99

Logger:
A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|--------------------|----------|--|--------------|--|
| | | INTERVAL | 3.0" TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 5.0 | | | Reworked Ferrelview Clay - Fill trace gravel. |
| 12.5 | 5.0 | 5.0 | CME 2 | 5.0 | | | Fat Clay (CH), dark gray, moist, stiff to 5-7.5 - limestone gravel with clay matrix, probable old road. 7.5-10.0 - lean clay (CL), olive gray, moist, stiff - Fill |
| 10 | 10.0 | 10.0 | CME 3 | 5.0 | | | Lean clay, silty, orange brown to light gray, with abundant black MnO and abundant FeO nodules, moist, v. stiff Ferrelview, 10.5' |
| 15 | 15.0 | 15.0 | CME 4 | 5.0 | | | Fat clay, mottled orange brown with some light gray, 1/4" FeO nodules, moist, very stiff, massive. Ferrelview 15.0' |
| | 20.0 | 20.0 | CME 5 | 5.0 | | | Fat Clay (CH) ~ 20% sand, some fine to coarse gravel, mottled orange brown to light gray, FeO nodules, MnO streaks, moist v. stiff CLAY TILL 17.5' |
| 20 | 20.0 | 20.0 | | | | | Fat clay (CH) trace sand, mottled orange brown light gray, black, massive. Moist very stiff, slickensided - 20' |
| 25 | 25.0 | 25.0 | | | | | Fat Clay (CH) ~ 10% fine to coarse sand ~ 5% fine gravel. Mottled yellow brown with some light gray, considerable black MnO. Moist, v. stiff. CLAY, TILL |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task 852

Hole Number

TSA-1-7

Project:

TCE at the Chem Plant

Location:

Inside TSA, NW

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 1330 | 25.0 | | CME 6 | 50 | | | Fat Clay (CH) ~ 15% sand & ~10% fine gravel, mottled yellow brown, orange brown, light gray & black, some FeO nodules, MnO streaks, moist very stiff, highly plastic CLAY TILL |
| 745 | 30.0 | | CME 7 | | | | 32.5' Fat Clay (CH) mottled reddish brown, orange brown, some light gray and black FeO nodules, moist, v. stiff - highly plastic CLAY TILL |
| 35 | 35.0 | | CME 8 | | | | 34.5' Clayey gravel, red high plastic clay matrix (CL) Residual |
| | 35.0 | | | | | | As above, red, orange brown, light brown black, zones of less gravel |
| 40 | 38.0 | | SPT | | 28 | 28 | 30' Chert and weathered limestone |
| | 39.5 | | | | | | T.D. 39.5' 1420 2/10/99 hole back filled with Grout Well bentonite slurry |
| 45 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number:
WP-476, TASK 15
Hole Number:
TSAI-8

| | | | |
|---|---------------------------------|--|-----------------------------------|
| Project: <u>TCE SOURCE INVESTIGATION</u> | | Location: <u>NW CORNER OF TSA (OUTSIDE FENCE)</u> | |
| Coordinates: | | Drilling Contractor: <u>GEO-TECHNOLOGY</u> | |
| Drill Make and Model: <u>CME-SS ATV MOUNT</u> | | Depth Top of Rock: <u>32</u> | Depth Casing & Size: <u>NA</u> |
| Elevation: | | Hole Size: <u>8.5"</u> | |
| Angle from Vert. and Bearing: <u>VERTICAL (0°)</u> | | Depth Bottom of Hole: <u>32.5'</u> | |
| Water Level: <u>NA</u> | Fluid & Additives: <u>NA</u> | Date Start: <u>2/19/99</u> | Date Finish: <u>2/19/99</u> |
| | | Logger: <u>Ni BOSS</u> | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | | | | FILL | LS gravel road base (0-1') |
| | 3 | | CME-1 | 3/3 | NA | DL | (1-5') Silty CLAY; blk; st med plas; little silt; some clay; damp; firm; no odor; tr. gty sand; roots appears reworked/compressed (Fill?) [Topsoil] |
| 5 | 3 | | CME-2 | 5/5 | NA | ML | (5-8.5') Clayey SILT; rd brn; sl plas; little clay; mostly silt; tr. of sand; damp-dry; no odor; FeOx stain; firm; loose?; fissile - solvent odor from 6-8' [Loose Silt] |
| 10 | 8 | | CME-3 | 5/5 | NA | CH | (8.5-14') CLAY; mottled rd brn; lt gray; med plas; tr. silt; some clay; tr. of subang gty; field sand; ore v. weathered granitic pebbles; v. stiff; damp; no odor; MnOx stain; FeOx nodules; silty sandstone [Native Ferruginous] |
| 15 | 13 | | CME-4 | 5/5 | NA | | (14-20) Silty CLAY; rd brn; med plas; some silt; some clay; little of gty, sandy sand; abundant MnOx stain; tr. round granitic pebbles; firm |
| 20 | 18 | | CME-5 | 5/5 | NA | CL | -> fine-med gty sand content from 18-22 (up to 20%) |
| 25 | 23 | | CME-6 | 5/5 | NA | | [CLAY TILE] |
| | 28 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project number:
WP-476, TASK 15
Hole Number
TSA1-8

Project: TCE SOURCE INVESTIGATION

Location: NW CORNER OF TSA (OUTSIDE FENCE)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | | 23 | OME-6 | 5/5 | NA | CL | See pg. 1 for description [CLAY TILL] |
| | | 28 | | | | | |
| | | 28 | OME-7 | 4.5/4.5 | NA | GC | (26-32) Clayey GRAVEL; white; lt. gray subangular subang. gravel; rd. brn clay matrix; little v. plus fines; v. clay; gravel is chert; ls up to 3" max; deep; p. sorted; gravel is mod weathered -matrix changes to lt. gray in color [Residual] |
| 30 | | 32.5 | | | | LS | (32-32.5) Weathered Limestone; lt. gray (N6) s.s. fossiliferous; mod weathered; fine-grained; high porosity; high v. to HCl; mod hard [Burlington - Keokuk] |
| 35 | | | | | | | Boring terminated @ 32.5' bgs due to refusal upon confirmed bedrock. Boring backfilled w/ bentonite slurry. |
| 40 | | | | | | | - Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for onsite PID head space screening. |
| 45 | | | | | | | |
| 50 | | | | | | | |
| 55 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
WP-476, TASK 15

Hole Number
TSA 2-1

Project:
TCE SOURCE INVESTIGATION

Location:
West side of TSA (outside fence)

Coordinates:
1041778.19N 753479.33E

Drilling Contractor:
GEOTECHNOLOGY

Drill Make and Model:
CME-55 ATV MOUNT

Depth Top of Rock:
-26.5'

Depth Casing & Size:
NA

Hole Size:
8.5"

Elevation:
654.15

Angle from Vert. and Bearing:
VERTICAL (0°)

Depth Bottom of Hole:
26.5'

Water Level:
NA

Fluid & Additives:
NA

Date Start:
2/16/99

Date Finish:
2/18/99

Logger:
N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | | | | | |
| | 3 | | CME-1 | 3/3 | NA | CL | (0-4) Silty CLAY; mottled rd brn; lt. gray; high plas; little silt; some clay; tr. vt-m gty sand; tr. little roots; damp; stiff-v. stiff; reworked; no odor; MnOx stain; 0-1.5' is highly organic [Ferralsol Fill] |
| 5 | 3 | | | | | | |
| | 8 | | CME-2 | 5/5 | NA | ML | (4-7) Clayey SILT; rd brn; sl. plas; little clay; mostly silt; tr. vt sand; damp-dry; no odor; FeOx staining; loose; firm [Roxana Silt] |
| | 8 | | | | | | |
| 10 | 8 | | | | | | |
| | 13 | | CME-3 | 5/5 | NA | CH | (7-14) CLAY; mottled rd brn; lt. gray; high plas; tr. silt; some clay; tr. vt subang gty; feld sand; v. stiff; damp; no odor; MnOx stain; FeOx nodules [Ferralsol Native] |
| | 13 | | | | | | |
| 15 | 13 | | | | | | |
| | 18 | | CME-4 | 5/5 | NA | | (14-23.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vt gty; feld sand; tr. high weather-granitic pebs; v. stiff; damp; no odor; abundant MnOx stain |
| | 18 | | | | | | |
| 20 | 18 | | | | | | |
| | 23 | | CME-5 | 5/5 | NA | CL | - < stiffness; fissile [CLAY TILL] |
| | 23 | | | | | | |
| 25 | 23 | | | | | | |
| | 26.5 | | CME-6 | 35/35 | NA | GCL | (23.5-26.5) Clayey GRAVEL; lt. gray gravel; rd brn matrix; little plas limo; v. dense; gravel is subang. chert; lt. to; damp; some roots; weathered; no odor [Residual] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

WP-476, TASK 15

Hole Number

TSA 2-1

Project:

TCE SOURCE INVESTIGATION

Location:

West side of TSA (outside fence)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS s-s-s (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|------------|------------------|-----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | | 23 24.5 | ONE-6 | 35/ 35 | NA | GC | See pg 1 for description [Residuum] |
| 30 | | | | | | | Boring terminated @ 26.5' bgs due to airgap / sampler refusal upon impenetrable bedrock. |
| 35 | | | | | | | Boring backfilled w/ bentonite slurry upon completion. |
| 40 | | | | | | | Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for PID headspace analysis. |
| 45 | | | | | | | |
| 50 | | | | | | | |
| 55 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

WP-476, TASK 15

Hole Number

TSA-2-2

Project: TCE SOURCE INVESTIGATION

Location: West side of TSA (outside fence)

Coordinates: 1041732.92 N 753486.52

Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model: CME-55 ATV MOUNT

Depth Top of Rock: NA

Depth Casing & Size: NA

Hole Size: 8.5"

Elevation: 656.06

Angle from Vert. and Bearing: VERTICAL (0°)

Depth Bottom of Hole: 27.5'

Water Level: NA

Fluid & Additives: NA

Date Start: 2/18/99

Date Finish: 2/18/99

Logger: N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | | | | FILL | (0-3) Silty CLAY; mottled rd brn; H-gray; high plas; little silt; some clay; tr. rounded gty sand; damp; stiff-vstiff; remolded; no odor; 0-1.5' highly argillaceous [Ferreous FILL] |
| 5 | 4 | | CME-1 | 4/4 | NA | CL/OL | |
| | 4 | | | | | ML | (3-6.5) Clayey SILT; rd brn; sl. plas; little clay; mostly silt; damp-dry; tr. vt. sand; no odor; abundant MnOx stain; firm; loose? [Roxana SILT] |
| | 9 | | CME-2 | 5/5 | NA | | |
| 10 | 9 | | | | | CH | (6.5-14.5) CLAY; mottled rd brn; H-gray; high plas; tr. silt; mostly clay; tr. vt. sandy-subround gty; field sand; v. stiff; damp; no odor; MnOx stain; FeOx nodes |
| | 14 | | CME-3 | 5/5 | NA | | |
| 15 | 14 | | | | | | [Native Ferralox] |
| | 19 | | CME-4 | 5/5 | NA | | (14.5-24.5) Silty CLAY; rd brn; med plas; some silt; some clay; little gty; field sand; tr. granitic pebbles; v. stiff; damp; no odor; abundant MnOx stain |
| 20 | 19 | | | | | CL | |
| | 24 | | CME-5 | 5/5 | NA | | -> silt w/ depth, possible |
| 25 | 24 | | CME-6 | 3.5/3.5 | NA | GCL | See pg. 2 for description [Residuum] |
| | 27.5 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, Task 15

Hole Number
TSA-2-2

Project: TCE SOURCE INVESTIGATION

Location: West side of TSA (outside fence)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | "-6"-5" (N) | | |
| 25 | 24 | | | | | | (24-27.5) Clayey GRAVEL; lt gray-white gravel; rd brn clay matrix; little fines; v dense; gravel is sub ang chert; lo; damp; p sorted; weathered; no odor |
| | 27.5 | ONE-6 | 35/25 | | NA | GC | |
| 30 | | | | | | | [Residuum] |
| 35 | | | | | | | Boring terminated @ 27.5' bgs due to sample; auger refusal upon impenetrable Residuum. |
| | | | | | | | Boring backfilled w/ bentonite slurry upon completion. |
| 40 | | | | | | | Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for PID headspace analysis. |
| 45 | | | | | | | |
| 50 | | | | | | | |
| 55 | | | | | | | |

BOREHOLE LOG

Sheet 1 of 2
Project Number:
Task 82
Hole Number:
TSA-2-3

Project: TCE at the Chem Plant Location: N. side TSA, outside fence, offset hole ~25' W.
Coordinates: 1041667.71N 753480.84E Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger Depth Top of Rock: Possibly 34' Depth Casing & Size: 4 1/4" / 8 1/4"
Elevation: 656.27' Angle from Vert. and Bearing: Vertical Depth Bottom of Hole: 34'
Water Level: — Fluid & Additives: — Date Start: 4/45 Date Finish: 4/45 Logger: A. Benfer
2/4/99 2/4/99

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | RECOVERY | STANDARD PENETRATION TEST RESULTS 5"-6"-5" (ft) | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------|----------|---------------|----------|---|--------------|---|
| | | INTERVAL | TYPE & NUMBER | | | | |
| | 0 | | CME 1 | 5.0 | | | Lean clay, (CL) dark brown, some organics, moist FILL |
| 5 | 5.0 | | CME 2 | 5.0 | | | Fat clay (CH) mottled orange brown and black, v. stiff, some FeO nodules FERREL VIEW CLAY |
| | | | | | | | as above, massive, some FeO & MnO nodules, v. stiff (3.0). |
| 10 | 10.0 | | CME 3 | 5.0 | | | mostly light gray, slickensided |
| 15 | 15.0 | | CME 4 | 5.0 | | | |
| 20 | 20.0 | | CME 5 | 5.0 | | | Fat Clay (CH) with ~15% sand and fine gravel, mottled orange brown and light gray - some MnO streaks v. stiff CLAY TILL |
| 25 | 25.0 | | | | | | at 23.5' a abundant fine gravel angular limestone |



Sheet 2 of 2
Project Number: Test 052
Hole Number: TSA-2-3

Location: W. Side TSA, outside fence offset
SOIL DESCRIPTION hole ~25' to west

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | 6"-8"-6" (N) | | |
| | | | | | | | |
| | | 25.0 | CME | | | | Gravel with Fat clay, gravel Weathered and soft. Clay orange brown, gravel light gray. CLAYTILL |
| | | | 6 | 4.0 | | | |
| | | 30.0 | | | LOSS | | |
| | | | CME | | | | As above - |
| | | | 7 | 2.0 | | | |
| | | 34.0 | | | LOSS | | |
| | | 35 | | | | | T.D. 34', auger refusal. 1445 2/24/99. Hole backfilled with Grout well bentonite. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task B52

Hole Number

TSA-2-4

Project:

TCE at the Chem. Plant

Location:

W. of TSA, outside fence, offset 400'

Coordinates:

1041619.59 N 753483.70 E

Drilling Contractor:

Geotechnology

Drill Make and Model:

CME-75 H.S. augers

Depth Top of Rock:

probable 37.5'

Depth Casing & Size:

4 1/2" / 8 1/4"

Hole Size:

4 1/2" / 8 1/4"

Elevation:

658.12

Angle from Vert. and Bearing:

vertical

Depth Bottom of Hole:

37.5'

Water Level:

Fluid & Additives:

Date Start: 10/25

2/4/99

Date Finish:

11/10

2/4/99

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------|----------|---------------|----------|-----------------------------------|--------------|--|
| | | INTERNAL | TYPE & NUMBER | RECOVERY | | | |
| | | | | | 6" x 6" x 6" (N) | | Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
| | 0 | | CME 1 | 5.0' | | | Lean Clay (CL), brown, some roots, moist Minor gravel - FILL increase gravel at 3', dark brown, 3.5' |
| 5 | 5.0 | | CME 2 | 5.0' | | | Lean Clay (CL), mottled brown and light brown, dark brown, some FeO nodules - FERRELVIEW CLAY. as above (Roxanna-like) |
| 10 | 10.0 | | CME 3 | 5.0' | | | Fat Clay (CH) mottled, orange brown and light gray, moist, stiff to very stiff (2.0) Ferrelview CH as above - massive Some slickensides and FeO nodules |
| 15 | 15.0 | | CME 4 | 5.0' | | | Predominantly light gray at 17.5' becoming sandy. at 19.5' - 1" sand lenses. |
| 20 | 20.0 | | CME 5 | 5.0' | | | |
| 25 | 25.0 | | | | | | Fat Clay with Sand (CH), ~ 15% - minor fine gravel, mottled yellow brown to orange brown, light brown, some MnO, CLAY TILL 22.5' |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Talk 852

Hole Number

TSA-2-4

Project:

TCE at the Chem. Plant

Location:

W. side TSA - outside fence

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 2 1/2 | TSA-2-4 25.0-27.5 | | increase in gravel. |
| | | | | | Lo ss | | |
| 30 | | 30.0 | CME 7 | 2 1/2 | TSA-2-4 30.0-32.5 | | Fat clay with angular limestone gravel up to 2"; some chert. |
| | | | | | Lo ss | | Clay orange brown. CLAY TILL; possibly Residual. |
| 35 | | 35.0 | CME 8 | 2 1/2 | | | As above, predominantly yellow brown. Probable residual |
| | | 37.5 | | | | | T.D. 37.5' auger refusal 1410 2/4/99. Probable bedrock. Hole back filled with Grout Well bentonite |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task 852

Hole Number:

TSA-3-1

Project:

TCE at the Chem. Plant

Location:

Outside Fence, W. side TSA - offset hole

Coordinates:

1041461-85N 753480.41

Drilling Contractor:

Geotechnology

Drill Make and Model:

CHE-75 H.S. Auger

Depth Top of Rock:

~ 30

Depth Casing & Size:

4 1/4" / 8 1/4"

Hole Size:

4 1/4" / 8 1/4"

Elevation:

656.11

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

30

Water Level:

Fluid & Additives:

Date Start: 0815

2/4/99

Date Finish: 0915

2/4/99

Logger:

A. Benfer

SOIL DESCRIPTION

Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol

Lean Clay, dark brown, some organics, Moist - Fcl CL

6-7', Lean clay, dark gray, abundant FeO & MnO nodules. Ferralview CL
7'- Fat Clay (CH), mottled orange brown, light gray, minor FeO nodules
Very stiff (3.0) Ferralview

Minor gravel at 14'
~ 15% sand at 15'

at 19' - gravelly

Fat Clay (CH) ~ 15% sand & fine gravel, yellow brown, black, moist
Very stiff - CLAY TILL
at 23' mostly gray & black

ELEVATION

DEPTH BELOW SURFACE

INTERVAL

SAMPLE

30"
TYPE & NUMBER

RECOVERY

STANDARD PENETRATION TEST RESULTS

6"-5"-6"
(N)

SYMBOLIC LOG

CHE
1
5.0'

CHE
2
5.0'

CHE
3
5.0'

CHE
4
5.0'

CHE
5
5.0'

5

10

15

20

25

5.0

5.0

10.0

10.0

15.0

15.0

20.0

20.0

25.0

20'



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 2

Project Number:

Notes Number

TSA-3-1

Project:

TCE at the Chem Plant

Location:

N. side TSA - Outside Fence

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOL - LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 25.0 | | CME 6 | 40' | | | fine to gravelly Fat Clay with sand - yellow brown, black, light Clay (gravel). Gravel is angular limestone, some chert. CLAYTILL |
| | 30.0 | | | | | | T.O. 30.0' auger Refusal 0915 |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task 852

Hole Number

TSA-3-2

Project: TCE at the Chem Plant

Location: inside TSA

Coordinates: 1041481.03N 753620.27E

Drilling Contractor: Geotech no 1094

Drill Make and Model: CNE-TS H.S. auger

Depth Top of Rock: possibly 32'

Depth Casing & Size: 2"

Hole Size: 4 1/4" / 8 1/4"

Elevation: 662.39

Angle from Vert. and Bearing: Vertical

Depth Bottom of Hole: 32'

Water Level: ---

Fluid & Additives: ---

Date Start: 1635

Date Finish: 1615

Logged: As Benfer

2/16/99

2/16/99

As Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5'-5'-5' (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CNE 1 | 5.0 | | | Lean clay, some gravel, mostly olive gray, moist stiff FILL |
| 5 | 5.0 | | CNE 2 | 5.0 | | | 6.0 Fat clay (CH) - mottled orange brown light, FeO nodules, moist, v. stiff. FERRELVIEW CLAY at 8.0' - massive, highly plastic |
| 10 | 10.0 | | CNE 3 | 5.0 | | | as above, slickensided |
| 15 | 15.0 | | CNE 4 | 5.0 | | | 16.0 Fat CLAY, trace sand & fine gravel, mottled yellow brown & light gray, some black (MnO). Moist v. stiff CLAY TILL |
| 20 | 20.0 | | CNE 5 | 5.0 | | | at 22.5' - increase in gravel and MnO. |
| 25 | 25.0 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 2

Project Number:
TAE 352

Hole Number:
TSA-3-2

Project: TCE at the Chem. Plant

Location: inside TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 5.0' | | | at 30.1' 4" clayey fine sand loose v. moist |
| | | 30.0 | | | | | 20.5' |
| | | 30.0 | CME | | | | Clayey Gravel - up to 1 1/2" black with white, highly plastic clay, abundant MnO, moist, dense |
| | | 32.0 | 7 | 2.0' | | | Probable Residual |
| | | | | | | | T.D. 32.0' refusal 11/15 2/4/99 hole grouted with Guard Well Bentonite |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

84063

Sheet 1 of 2

Project Number:

Task 852

Hole Number:

TSA-3-3

Project: TCE at the Chem. Plant Location: Inside TSA (2nd hole, Moved ~ 3)

Coordinates: 104 1405.31 N 753555.52 E Drilling Contractor: Geotechnology

Drill Make and Model: CME-75 Depth Top of Rock: 42.5' Depth Casing & Size: Hole Size: 4 1/4" / 8 1/4"

Elevation: 665.0' Angle from Vert. and Bearing: Vertical Depth Bottom of Hole: 42.5'

Water Level: Fluid & Additives: Date Start: 0950 2/10/99 Date Finish: 1400 2/10/99 Logger: H. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------|----------|---------------|-----------------------------------|--------------|--|
| | | INTERVAL | TYPE & NUMBER | | | |
| | | 3.0' | | 6" 6" 6" (N) | | Name, Gradation or Plasticity, Particle Size Distribution; Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
| | 0 | | CME 1 3 1/2 | | | Lean clay (CL) mottled orange brown and light brown, moist, v. stiff, trace gravel. Reworked Ferrelview FILL |
| 5 | 5.0 | | CME 2 5.0' | | | mostly olive gray, trace gravel FILL |
| 10 | 10.0 | | CME 3 5.0' | | | FILL 12.0' |
| 15 | 15.0 | | CME 4 5.0' | | | Lean Clay (CL), silty, mottled orange brown and gray, abundant FeO nodules, moist stiff Ferrelview |
| | 20 | | CME 5 5.0' | | | CL - with light gray, FeO, MnO nodules, v. stiff (3.0) |
| 25 | 25.0 | | | | | Fat clay, ~ 10% sand and fine gravel, mottled orange brown, gray, moist, v. stiff at 23' - mostly light gray. (CLAY TILL) |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 21

Project Number:

Task 852

Hole Number

TSA-3-3

Project:

TCE at the Chem. Plant.

Location:

inside TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 0"-5"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 25.0 | | CME 6 | 50' | | | INCREASE in gravel content |
| | 30.0 | | | | | | at 29' heavy gravel |
| 30 | 30.0 30.0 | | CME 7 | 5.0 | | | Fat Clay (CH) occasional gravel, orange brown and black, moist, stiff. |
| | 35.0 | | | | | | at 33.5' - CH, light gray with indur- ated clay fragments (unusual), damp |
| | 35.0 | | CME 8 | 35' | | | at 35' heavy gravel. |
| | 40.0 | | | | | | Clay with gravel, light gray and orange brown. probably CLAY Till |
| | 42.9 | | CME 9 | | | | Fat Clay (CH) with chert gravel, reddish brown possibly Residual |
| | | | | | | | T.D. 42.5' Refusal on bedrock 1335 2/8/99 Hole back filled with benton ite |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task 852

Hole Number

TSA-3-4

Project: TCE at the Chem. Plant

Location: SW corner TSA outside fence, offset ~8'

Coordinates: 1041328.06N 753423.40

Drilling Contractor: Geotechnology

Drill Make and Model: CME-75 H.S. Auger

Depth Top of Rock: probable 37'

Depth Casing & Size:

Hole Size: 4 1/4" / 8 1/4"

Elevation: 757.06'

Angle from Vert. and Bearing: Vertical

Depth Bottom of Hole: 37'

Water Level:

Fluid & Additives:

Date Start: 1400
2/3/99

Date Finish: 1530
2/3/99

Logger: A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-8"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 5.0' | TSA-A-4 0-2.5' | | Lean clay with occasional limestone gravel (CL), roots to ~1.0', dark brown, moist, very stiff (2.5). Till |
| | | | | | TSA-A-4 2.5-5.0' | | |
| 5 | 5.0 | 5.0 | CME 2 | 5.0 | TSA-A-4 5.0-7.5' | | Lean clay (CL), mottled light brown, gray orange brown, FeO, MnO, moist, very stiff (2.5). Ferralview. Mostly light gray (Rokanna-like) |
| | | | | | TSA-A-4 7.5-10.0' | | Mostly orange brown. |
| 10 | 10.0 | 10.0 | CME 3 | 5.0 | TSA-A-4 10.0-12.5' | | Fat clay, mottled orange brown and light gray, moist, very stiff (3.0). Some slickensides |
| | | | | | TSA-A-4 12.5-15.0' | | Abundant FeO nodules 12-14'. |
| 15 | 15.0 | 15.0 | CME 4 | 5.0 | TSA-A-4 15.0-17.5' | | CH. Mottled reddish brown, light gray + black (MnO). |
| | | | | | TSA-A-4 17.5-20.0' | | at 17', some fine limestone gravel and angular limestone sand, white. Lower Ferralview. |
| 20 | 20.0 | | CME 5 | 5.0 | TSA-A-4 20.0-22.5' | | Fat clay with gravel, up to 2" (CH), yellow brown + black (MnO), minor light gray. Some sand. Clay Till |
| | | | | | TSA-A-4 22.5-25.0' | | |
| 25 | 25.0 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
TASK 852

File Number:
TSA-3-4

Project: TSA at Chem Plant

Location: SW corner TSA outside Fence

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 25.0 | | CME 6 | 5.0' | TSA-A-4 25.0-27.5 | | Lean Clay (CL) minor fines from gravel, buff, damp, very stiff (PP=2.5) |
| | 27.5 | | | | TSA-A-4 27.5-30.0 | | |
| 30 | 30.0 26.0 | | CME 7 | 5.0' | | | Mostly yellow brown, moist, with angular limestone and chert gravel. Possibly Residual saturated ~ 33'-34', |
| 35 | 35.0 | | Auger only | | | | sample refusal |
| | | | | | | | auger refusal 37', probable bedrock 1530 2/3/99 grouted hole with grout - Well |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Talk 852

Hole Number:

TSA-IS-3-5

Project: TCE at the Chem Plant Location: inside TSA, south end

Coordinates: 1041353.87N 753646.26E Drilling Contractor: Geotech 101094

Drill Make and Model: CME-75 H.S. Auger Depth Top of Rock: probably 31.5' Depth Casing & Size: — Hole Size: 4 1/4" / 8 1/4"

Elevation: 665.63 Angle from Vert. and Bearing: Vertical Depth Bottom of Hole: 31.5'

Water Level: — Fluid & Additives: — Date Start: 1/4/99 Date Finish: 2/6/99 Logger: H. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5 1/4" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|--------------------|----------|--|--------------|--|
| | | INTERVAL | 3.0" TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 50' | | | Lean Clay (CL) mostly dark gray with some gravel, moist stiff - at 2.5' - mostly orange brown and gray. Reworked Ferrelview |
| 5 | 5.0 | | CME 2 | 5.0' | | | some olive gray FILL |
| 10 | 10.0 | | CME 3 | 4.0' | | | 8.0' Fat Clay (CH) mottled orange brown & gray, moist, v. stiff, abundant FeO nodules - Ferrelview. |
| 15 | 15.0 | | CME 4 | 5.0' | | | massive, very plastic, less FeO. |
| 20 | 20.0 | | CME 5 | 5.0' | | | stickensided, MnO |
| 25 | 25.0 | | | | | | as above - ~ 10% sand, Trace fine gravel |
| | 23.5 | | | | | | Fat Clay (CH) mottled yellow brown & gray, ~ 10% sand, trace fine gravel. Moist stiff CLAY TAIL |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Talk 852

Hole Number

TSA-15-3-5

Project: TCE at the Chem Plant

Location: inside TSA - south end

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 50' | | | Fat Clay (CH), ~ 15% sand, 10% fine gravel, moderate vel. brn, light gray, some black (MnO), moist v. stiff - CLAY TILL increase in gravel, up to 2". |
| 30 | 30.0 | 30.0 | CME | 15' | | | at 29.5 - abundant MnO - black |
| | 31.5 | 31.5 | 7 | | | | abundant gravel, light brown to white. Maybe Residual. |
| 35 | 31.5 | | | | | | T.O. 31.5' 1500 2/6/99 Refusal Hole grouted with Grout Well bentonite. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Kevin Bessler
driller

Sheet 1 of 2

Project Number:

Task 052

Hole Number

TSA-3-6

Project:

TCE at the Chem Plant

Location:

SW corner TSA outside fence

Coordinates:

1041262.41N 753537.09E

Drilling Contractor:

Geotech No 1094

Drill Make and Model:

CME - 75 H.S. Auger

Depth Top of Rock: ?

Depth Casing & Size:

Hole Size:

4 1/4" / 8 1/4"

Elevation:

660.85'

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

28'

Water Level:

Fluid & Additives:

Date Start: 0955

Date Finish:

1300 2/3/99

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------|----------|---------------|----------|-----------------------------------|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | | | | 5"-8"-8" (N) Samples | | Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
| 1 | 0 | | CME | | TSA-3-1 | | 0-1.0' - Lean Clay with limestone gravel, dark brown, waxy, topsoil CL Lean Clay (CL), mottled orange brown and light brown with dark gray, minor FeOx MnO, moist, v. stiff (2.5) Ferrelview Clay (Roxanna-like) |
| 2 | | | 1 | 35' | — | | |
| 3 | | | | | TSA-3-1 | | |
| 4 | 4.5 | | | | | | |
| | 4.5 | | CME | | TSA-3-2 | | 8.5' Fat clay, (CH), mottled orange brown & light gray, minor MnO, v. stiff (2.5) Ferrelview. at 12' mostly light gray |
| | | | 2 | 5.0 | — | | |
| | | | | | TSA-3-2 | | |
| | | | | | | | |
| 10 | 9.5 | | CME | | TSA-3-3 | | As above |
| | | | 3 | 5.0' | — | | |
| | | | | | TSA-3-3 | | |
| | | | | | | | |
| 15 | 14.5 | | CME | | TSA-3-4 | | at 20', with fine limestone gravel and angular sand, white, ~ 15% lower Ferrelview |
| | | | 4 | 5.0' | — | | |
| | | | | | TSA-3-4 | | |
| | | | | | | | |
| 20 | 19.5 | | CME | | TSA-3-5 | | 24.5' |
| | | | 5 | 5.0' | — | | |
| | | | | | TSA-3-5 | | |
| | | | | | | | |
| 25 | 24.5 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

84063

Sheet: 2 of 2

Project Number:

Task 052

Plot Number

TSA-3-C

Project: TCE at the Chem. Plant

Location: SW corner TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | | CME 6 | | | | lean clay with localized coarse lime- stone gravel, (CL), localized abundant MnO, yellow brown, black, moist. CLAY TILL |
| 30 | | 295 | | | | | Refusal, T.D. 28.0'. Probably Not bedrock. Clay till too thin. 1300 2/3/99. grouted hole with 3, 50# bags of Grout. well. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

WP-476, TASK 15

Hole Number

TSA 3-7

Project: TCE SOURCE INVESTIGATION

Location: SW CORNER OF TSA (outside fence)

Coordinates: 1044245.30 N, 753645.58 E

Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model: CME-55 ATV MOUNT

Depth Top of Rock: 37

Depth Casing & Size: NA

Hole Size: 8.5"

Elevation: 664.54'

Angle from Vert. and Bearing: VERTICAL (0°)

Depth Bottom of Hole: 37

Water Level: NA

Fluid & Additives: NA

Date Start: 2/17/99

Date Finish: 2/17/99

Logger: N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-4"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME-1 | 5/5 | NA | OL | (0-2) Silty CLAY; blk; sl med plas; little silt; some clay; damp; firm; org odor; tr. gty sand; roots; [TOPSOIL] |
| 5 | 5 | | | | | ML | (2-7.5) Clayey SILT; rd brn; sl plas; little clay; mostly silt; tr. vt sand; damp-dry; no odor; FeOx stain; firm; loose?; fissile; abundant FeOx nodules |
| | 5 | | CME-2 | 5/5 | NA | | [Brown silt] |
| 10 | 10 | | | | | | (7.5-20) CLAY; mottled rd brn; lt. gry; high plas; tr. silt; some clay; tr. vt subang gty; fine sand; re v. weathered granitic pebbles; v. stiff; damp; no odor; MnOx stain; FeOx nodules; slickensided |
| | 10 | | CME-3 | 5/5 | NA | CH | |
| 15 | 15 | | | | | | |
| | 15 | | CME-4 | 5/5 | NA | | |
| 20 | 20 | | | | | | [Native Ferrelview] |
| | 20 | | CME-5 | 5/5 | NA | CL | (20-26.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vt gty, subang sand; abundant MnOx stain; tr. round granitic pebbles; firm |
| 25 | 25 | | | | | | [CLAY TILE] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, Task 15

Hole Number:
TSA3-7

Project: TCE SOURCE INVESTIGATION

Location: SW CORNER OF TSA (OUTSIDE FENCE)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS "6"-6"-6" (2) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | 25 | | | | | CL | See pg. 1 for description [CLAY TILL] |
| | | | CME-6 | 5/5 | NA | GC | (26.5-37) Clayey GRAVEL; lt. gray-white gravel; rd brn - rd clay matrix; little plus fines; v. dense; gravel is subang chert 1/2 to 1; damp; p. sorted; weathered; no odor |
| 30 | 30 | | | | | | |
| | | | CME-7 | 5/5 | NA | | - clay matrix grades to lt. gray; > to 50% |
| 35 | 35 | | | | | | |
| | | | CME-8 | 2/2 | NA | | [Residuum] |
| | | | | | | | Boring terminated @ 37' bgs due to sampler/ auger refusal upon suspected bedrock. |
| 40 | | | | | | | Boring backfilled w/ bentonite slurry upon completion. |
| 45 | | | | | | | Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for PID headspace analysis. |
| 50 | | | | | | | |
| 55 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task 052

Hole Number:

TSA-3-B

Project:

TCE at the Chem Plant

Location:

Inside the TSA, South end. off set

Coordinates:

1041321.03N 753708.15E

Drilling Contractor:

Geotechn. log

Hole ~ 5' N

Drill Make and Model:

CME-75 H.S. Auger

Depth Top of Rock:

31' +

Depth Casing & Size:

—

Hole Size:

4 1/4" / 8 1/4"

Elevation:

666.95'

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

31'

Water Level:

—

Fluid & Additives:

—

Date Start:

11/15

Date Finish:

2/6/99

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 5.0' | | | Lean Clay (CL) mottled orange brown & light brown with FeO nodules, moist, stiff. Reworked Ferrelview at 2.5', dark brown to olive gray. Minor gravel FILL |
| 5 | 5.0 | | CME 2 | 5.0' | | | |
| 10 | 10.0 | | CME 3 | 5.0' | | | Silty lean Clay (CL), mostly light brown, stiff with MAO & FeO nodules, moist Ferrelview Clay Roxanna-like |
| 15 | 15.0 | | CME 4 | 5.0' | | | Fat Clay (CH), mottled orange brown & light gray with FeO nodules, massive, moist, v. stiff Ferrelview |
| 20 | 20.0 | | CME 5 | 5.0' | | | at 18', mottled reddish brown & light gray, increased MAO. |
| 25 | 25.0 | | | | | | as above, reddish brown, trace sand & fine gravel. lower Ferrelview |

25'



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task 052

Hole Number:

TSA-3-B

Project:

TCE at the Chem Plant

Location:

inside TSA, south end

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5'-5'-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 26.0 | | CHE 6 | 50' | | | Fat Clay (CH), Minor gravel, ~10% Sand, mottled yellow brown, black, some light gray, moist, V. stiff. 29'-30' abundant MnO CLAY TILL |
| | 28.0 | | | | | | |
| | 31.0 | | CHE 7 | | | | gravelly, light gray, damp |
| | | | | | | | T.O. 31' 0045 2/6/99 Auger Refusal. Probably Not bedrock, Clay Till too thin. Hole back filled with Grout Well Bentonite. |
| 40 | | | | | | | |

2/5/99

2/6/99

2/6/99



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

TAS 852

Hole Number:

TSA-4-1

Project: TCE at the Chem Plant

Location: Inside TSA - NE

Coordinates:

Drilling Contractor:

Geo Tech 101094

Drill Make and Model:

CME-75 H.S. auger

Depth Top of Rock:

45'

Depth Casing & Size:

Hole Size:

4 1/4" / 8 1/4"

Elevation:

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

45.5'

Water Level:

Fluid & Additives:

None

Date Start: 12/40

2/11/99

Date Finish: 0920

2/12/99

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 5.0 | | | Reworked Ferrelview - Fill 4.0' |
| 5 | 5.0 | | CME 2 | 5.0 | | | Lean clay (CL), silty, abundant FeO ₄ MnO ₂ , mottled orange brown light brown, minor gray, Moist: Stiff. Ferrelview B: (Roxann-like) |
| 10 | 10.0 | | CME 3 | 5.0 | | | Fat Clay (CH), mottled orange brown and light gray, FeO and MnO nodules, massive, v. stiff. Ferrelview as above, mostly orange brown with streaks of light gray) slickensided. |
| 15 | 15.0 | | CME 4 | 5.0 | | | at 15', mostly light gray with minor orange brown at 17' - MnO streaks appear. Ferrelview 19.0' |
| 20 | 20.0 | | | | | | Fat Clay (CH) ~ 10% sand, trace fine gravel, orange brown with minor light gray, abundant MnO fracture coating, some FeO nodules, moist v. stiff. CLAY TILL |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
Task 852Hole Number
TSA-4-1

Project: TCE at the Chem Plant

Location: inside TSA, NE

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 0'-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|--------------|------------------|----------|---|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 2/11/199 | 20 | 20.0 | CME 5 | 5.0' | | | Fat clay (CH) ~ 15% sand, with fine gravel, mostly yellow brown with light gray and black streaks (MND), moist, v. stiff CLAY TILL |
| 2/12/199 | 25 | 25.0 25.0 | CME 6 | 5.0' | | | CH as above, ~10% gravel. |
| 2800 | 30 | 30.0 30.0 | CME 7 | 5.0' | | | CH as above, light gray follows fractures such as paleo des- sication cracks and possibly old stickensides, black MND coats fractures |
| | 35 | 35.0 35.0 | CME 8 | 5.0' | | | at 32.5', Fat clay (CH), red with minor light gray, highly plastic, minor sand moist, v. stiff. likely residual (37) |
| 405 | 40 | 40.0 40.0 | CME 9 | 4.0' | | | Clayey gravel (GC) angular chert with red highly plastic clay matrix, moist, dense. Residual at 40', matrix brownish black possibly highly weathered limestone in sampler tip. |
| | 45.0 | 45.0 | | | 2095 | | weathered limestone 45.0' |
| | | | | | | | T.O. 45.5', Refusal on bed rock 0920, 2/12/99. Hole backfilled with Great Wall bentonite slurry. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

WP476, Task 15

Hole Number

TSA4-2

Project: TLE SOURCE Investigation

Location: NE CORNER OF TSA

Coordinates: 1041937.33 N, 753876.70 E

Drilling Contractor: GGDTECHNOLOGY

Drill Make and Model: CME-55 ATV MOUNT

Depth Top of Rock: -39

Depth Casing & Size: NA

Hole Size: 8.5"

Elevation: 661.34

Angle from Vert. and Bearing: VERTICAL (10°)

Depth Bottom of Hole: 39

Water Level: NA

Fluid & Additives: NA

Date Start: 2/12/99

Date Finish: 2/12/99

Logger: N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | 0 | CME-1 | 35/4 | NO REC FROM 0-8.5' | CL | (0-3.5) silty CLAY; mottled rd brn & H. gray; high plas; little silt; some clay; tr. vt. m. gty. sand; damp; v. stiff; reworked; no odor; MnOx stain; FeOx nodules; stain [Ferreolite view field] |
| 5 | 4 | 4 | CME-2 | 5/5 | NA | OL | (3.5-5) silty CLAY; blk; sh. med. plas; little silt; some clay; damp; firm; organic odor; tr. sand; roots [Remnant Topsoil] |
| 10 | 9 | 9 | CME-3 | 5/5 | NA | CH | (5-16.5) CLAY; mottled rd brn & H. gray; high plas; little silt; some clay; tr. vt. gty; field sands; tr. granitic pebbles (weathered); v. stiff; damp; slickensided; no odor; MnOx stain; FeOx nodules |
| 15 | 14 | 14 | CME-4 | 5/5 | NA | | [Native Ferrel view] |
| 20 | 19 | 19 | CME-5 | 5/5 | NA | CL | (16.5-33) silty CLAY; rd brn; med plas; some silt; some clay; little vt. gty, suborg. sand; tr. high weathered granitic pebbles; stiff; damp-dry; no odor; |
| 25 | 24 | 24 | CME-6 | 5/5 | NA | | - increased MnOx stain; peb content w/ depth |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

WP-476, TAB 15

Hole Number

TSA-4-2

Project:

TLE SOURCE Investigation

Location:

NE CORNER OF TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS s-s-s- (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | | 24 | | | | | See pg 1 for description |
| | | | CME-6 | 5/5 | NA | | |
| | | 27 | | | | | CL |
| | | | CME-7 | 5/5 | NA | | |
| 30 | | 29 | | | | | [CLAY TILL] |
| | | | CME-8 | 5/5 | NA | | |
| | | 34 | | | | | (33-40) Clayey Gravel; white; lt. gray gravel; red matrix; little v. plus fines; v. dense; gravel is chert / ls up to 3" max; damp; p. sorted; gravel mod weathered; no odor - matrix from 38-39 is v. lt. gray w/ < chert |
| | | 34 | | | | | |
| 35 | | | | | | | GC |
| | | | CME-8 | 5/5 | NA | | |
| | | 39 | | | | | [Residuum] |
| | | 39 | | | | | |
| 40 | | 39-40 | SS-1 | 1/1 | NA | | Boring terminated @ 39' bgs due to auger / sampler refusal upon suspected bedrock; |
| | | | | | | | Boring backfilled w/ bentonite slurry upon completion. |
| | | | | | | | Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for PID hydrocarbon analysis |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number:
WP-476, Task 15
Hole Number
TSAS-1

| | | | |
|--|--|--|-----------------------------------|
| Project: <u>TLE Source Investigation</u> | | Location: <u>Southern end of TSA</u> | |
| Coordinates: <u>1041575.34 N, 753828.02 E</u> | | Drilling Contractor: <u>GEOTECHNOLOGY</u> | |
| Drill Make and Model: <u>OME-55 ATV MOUNT</u> | | Depth Top of Rock: <u>NA</u> | Depth Casing & Size: <u>NA</u> |
| Elevation: <u>660.53</u> | | Depth Bottom of Hole: <u>28.5'</u> | |
| Water Level: <u>NA</u> | | Fluid & Additives: <u>NA</u> | Date Start: <u>2/9/99</u> |
| | | Date Finish: <u>2/10/99</u> | Logger: <u>N. BOSS</u> |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | OME-1 | 3/3 | NA | CL | (0-11.5) Silty CLAY; mottled rd. brn; lt. gray; high plasticity; little silt; some clay; tr. of gty; field sand; v. stiff; damp; no odor; min Or stain; FeOr nodules [Native Ferrelview] |
| | 3 | | OME-2 | 5/5 | NA | | |
| | 8 | | OME-3 | 5/5 | NA | | |
| 10 | 13 | | OME-4 | 5/5 | NA | CL | (11.5-27) Sandy CLAY; rd. brn; mod plastic; little vt-m gty; field sand, subang-subround; some clay; tr. weathered granitic pebs; stiff; damp-dry; no odor; min Or stain; FeOr nodes; weathered [CLAY TILE] |
| 15 | 18 | | OME-5 | 5/5 | NA | | |
| 20 | 23 | | OME-6 | 5/5 | NA | | |
| 25 | 28 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 2

Project Number:
WP476, TASK 15

Hole Number
TSAS-1

Project: TLE SOURCE Investigation

Location: SOUTHERN END OF TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 0"-10"-20" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | | 23 | 6 | 5/5 | NA | CL | See pg 1 for description |
| | | 20 | Cont-6 | | | GLC | 27-28.5 Clayey GRAVEL; wh. H. grey chert (1/2 gravel; up to 2"); little upper fine; clay matrix is rd brn; y. dense; damp; p. sorted; so brn. sub round gravel appears med weathered (no distinct color) |
| | | 20-28.5 | SS-1 | 0.5/0.5 | 50+ | | Boring terminated @ 28.5' bgs due to auger / sampler refusal upon impenetrable Residuum. TD correlates w/ findings; elevation change w/ respect to TSA 5-2. |
| 30 | | | | | | | Boring backfilled w/ Bentonite slurry upon completion |
| 35 | | | | | | | Samples collected in 1-gal Ziploc @ 25' intervals as composites for PID headspace analysis |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
WP-476, TASK 15

Hole Number
TSAS-2

Project: TLE SOURCE INVESTIGATION

Location: SE CORNER OF TSA

Coordinates: 1041471.95N 753832.04E

Drilling Contractor: GEDTECHNOLOGY

Drill Make and Model: CME-55 AT1 MOUNT

Depth Top of Rock: N/A

Depth Casing & Size: NA

Hole Size: 8.5"

Elevation: 662.20'

Angle from Vert. and Bearing: VERTICAL (10°)

Depth Bottom of Hole: 30' bgs

Water Level: DRY

Fluid & Additives: NA

Date Start: 2/8/99

Date Finish: 2/8/99

Logger: N. BOSS

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | CME-1 | 35/35 | NA | CL | (0-13.5) Silty CLAY; mottled rd. brn; 1-layers; high plastic; little silt; some clay; tr. of gty & feld sands; v. stiff-hard; damp; slickensided; no odor; Mn or stain; Fe or nodules; [Native Ferrel view] |
| 5 | 3.5 | | CME-2 | 5/5 | NA | | |
| | 8.5 | | | | | | - < mottling to 10' group |
| 10 | 13.5 | | CME-3 | 5/5 | NA | | -> increasing sand in Mn or w/ depth |
| 15 | 18.5 | | CME-4 | 5/5 | NA | | (13.5-28) Silty CLAY; rd brn; med plastic; some silt; some clay; little of gty, subang sand; tr. highly weathered granitic pebs; stiff; damp-dry; no odor; abundant Mn or stain; weathered. |
| 20 | 23.5 | | CME-5 | 5/5 | NA | CL | [CLAY TILL] |
| 25 | 28.5 | | CME-6 | 5/5 | NA | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, TASK 15

Hole Number
TSA5-2

Project: TCE SOURCE INVESTIGATION

Location: SE CORNER OF TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | 6"-5"-8" (%) | | |
| 25 | | 25.5 | CME-6 | 5/5 | NA | CL | (13.5-28) See pg 1 for description |
| | | 28.5 | | | | | |
| | | 28.5 | CME-7 | 15/15 | NA | GC | (28-30) Clayey Gravel; white - light gray chert; 1/2 gravel (up to 3"); little v. plus fines; clay matrix is red-brown; v. dense; clay; 1/2 sorted subangular. subangular gravel appear mod weathered (cracked) |
| 30 | | 30.0 | | | | | |
| | | | | | | | Boring terminated at 30' bgs due to auger / sampler refusal upon impervious Residual. Boring backfilled w/ bentonite slurry. |
| | | | | | | | - Samples collected in 1 gal Zip'loc @ 2.5' Intervals as composites for on-site PID needs pore screening. |
| 35 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

Task 852

Hole Number:

TSA-5-3

Project: TCE at the Chem. Plant

Location: Inside TSA, SE

Coordinates: 1041339.66N 753831.92E

Drilling Contractor: Geotechnology

Drill Make and Model: CME-75 H.S. auger

Depth Top of Rock: possibly 35'

Depth Casing & Size:

Hole Size: 4 1/4" / 8 1/4"

Elevation: 666.20'

Angle from Vert. and Bearing: Vertical

Depth Bottom of Hole:

35'

Water Level:

Fluid & Additives:

Date Start: 1500

Date Finish: 1615

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | RECOVERY | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (3) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|---|
| | | INTERVAL | TYPE & NUMBER | | | | |
| | 0 | | CME | | | | Lean Clay (CL), Silty, Mottled orange brown & gray, moist, stiff, with 1/4" MnO nodules - Ferrelview Roxanna-like |
| | 1 | | 50 | | | | |
| 5 | 5.0 | | CME | | | | |
| | 5.0 | | 2 | 50 | | | |
| 10 | 10.0 | | CME | | | | Fat Clay (CH) Mottled orange brown & gray, moist, v. stiff, massive, FeO nodules Ferrelview CLAY highly plastic, slickensided, orange brown & light gray, 1/16" FeO nodules, Trace white angular sand |
| | 10.0 | | 3 | 50 | | | |
| 15 | 15.0 | | CME | | | | Trace fine gravel, |
| | 15.0 | | 4 | 50 | | | |
| 20 | 20.0 | | CME | | | | Fat Clay, ~15% sand & fine gravel, orange brown with light gray & black streaks (MnO), moist, v. stiff - CLAY TILL - increase in sand & gravel & MnO. |
| | 20.0 | | 5 | 50 | | | |
| | 25.0 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task 852

Hole Number:

TSA-5-3

Project:

TCE at the Chem Plant

Location:

inside TSA, SE corner

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|--------------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 50' | | | Pockets of weathered limestone gravel. 27.5' - 30.0' - less sand & gravel, highly plastic, slickensided, FeO nodules CLAY TILL |
| 30 | | 30.0 30.0 | CME 7 | 50 | | | Fat clay with gravel pockets orange brown, red, gray black |
| 35 | | 35.0 | | | | | 34' Grout with Clay or Gravel, light gray, clay highly plastic, Chert & weathered limestone Probable Residual T.O. 35', refusal. 1615 2/8/99 hole grouted with Grout well Bentonite Made by Wyo-Ber. 3, 50 bags mixed with 26 gals water / bag. |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
WP-476, TASK 15

Hole Number:
TSA-5-4

| | | | |
|--|--|---|-----------------------------------|
| Project: <u>TCE SOURCE INVESTIGATION</u> | | Location: <u>SE CORNER OF TSA (outside fence)</u> | |
| Coordinates: <u>1041255.53N, 753858.47E</u> | | Drilling Contractor: <u>GEO TECHNOLOGY</u> | |
| Drill Make and Model: <u>CME-SS ATV MOUNT</u> | | Depth Top of Rock: <u>NA</u> | Depth Casing & Size: <u>NA</u> |
| Elevation: <u>671.62'</u> | | Angle from Vert. and Bearing: <u>VERTICAL (0°)</u> | |
| Water Level: <u>NA</u> | | Depth Bottom of Hole: <u>40</u> | |
| Fluid & Additives: <u>NA</u> | | Date Start: <u>2/17/99</u> | Date Finish: <u>2/17/99</u> |
| | | Logger: <u>N. BOSS</u> | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | | | NO REC FROM 0-2' | | 10-2) GRAVEL, ls, road base |
| | 4 | | CME-1 | 2/4 | | CL | (2-5) Silty CLAY; mottled rd brn / lt. gray; high plastic; little silt; some clay; tr. gty sand; damp; stiff; reworked; no odor; MnOx stain; FeOx nodes [Ferruginous Fe] |
| 5 | 4 | | | | | | |
| | 9 | | CME-2 | 5/5 | NA | | (5-26.5) CLAY; mottled rd brn / lt. gray; high plastic; tr. silt; mostly clay; tr. v. med gty sand; v. stiff; damp; slickensided; no odor; MnOx stain; FeOx nodes |
| 10 | 9 | | | | | | |
| | 14 | | CME-3 | 5/5 | NA | | |
| 15 | 14 | | | | | | |
| | 19 | | CME-4 | 5/5 | NA | CH | |
| 20 | 19 | | | | | | |
| | 24 | | CME-5 | 5/5 | NA | | |
| 25 | 24 | | | | | | |
| | 29 | | CME-6 | 5/5 | NA | | [Native Level New] |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP-476, Task 15

Hole Number
TSA-5-4

Project: TCE SOURCE INVESTIGATION

Location: SE CORNER OF TSA (OUTSIDE)

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (25) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | 24 | | ONE-6 | 5/5 | NA | CH | See pg. 1 for description [Native Ferrelview] |
| | 29 | | | | | | |
| 30 | 29 | | ONE-7 | 5/5 | NA | CL | (26.5-37.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vf gty; suborg sand; tr. high weathered granitic pebbles; abundant MnOx stain; no odor; stiff |
| | 34 | | | | | | |
| 35 | 34 | | ONE-8 | 5/5 | NA | | [CLAY TILL] |
| | 39 | | | | | | |
| 40 | 39-40 | | ONE-9 | 1/1 | NA | GC | (37.5-40) Clayey GRAVEL; lt gray suborg chert gravel; rd brn clay matrix; little plus fine; v. dense; damp; P. sorted; weathered; no odor [Residuum] |
| | | | | | | | Boring terminated @ 40' bgs due to sampler /auger refusal upon impenetrable Residuum. |
| 45 | | | | | | | Boring back filled w/ bentonite slurry upon completion. |
| 50 | | | | | | | Samples collected in 1 gal Ziploc @ 25' intervals as composites for PID headspace analysis |
| 55 | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

TASK 852

Hole Number:

TSA-G-1

Project: TCE at the Chem Plant

Location: Inside TSA, SE

Coordinates: 1041500.75 N 753936.36 E

Drilling Contractor: Geotechnology

Drill Make and Model: CME-75 H.S. Auger

Depth Top of Rock:

35.0'

Depth Casing & Size:

Hole Size:

4 1/4" / 8 1/4"

Elevation: 665.39

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

35.5'

Water Level:

Fluid & Additives:

Date Start: 0750

Date Finish:

Logger:

M. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOL DESCRIPTION |
|-----------|---------------------|-----------|---------------|-----------------------------------|--------------|--|
| | | INTERVAL | TYPE & NUMBER | | | |
| | | | | 6"-5"-6" (N) | | Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
| 1800 | 0 | | CME 1 | 5.0' | | Fat clay (CH), mottled orange brown with minor light gray, minor FeO nodules, more abundant 0-1.5', massive, moist, v. stiff - Ferrelview clay - upper Ferrelview missing. |
| 1805 | 5 | 5.0-5.0 | CME 2 | 5.0' | | CH as above, from 5-7.5'; predominantly light gray; from 7.5'-10.0' mostly orange brown, slickensided |
| | 10 | 10.0-10.0 | CME 3 | 5.0' | | CH as above, trace sand & fine gravel, MnO streaks, slickensided |
| | 15 | 15.0-15.0 | CME 4 | 5.0' | | 140' Fat Clay (CH), ~20% well graded sand, trace fine gravel, mottled yellow brown and light gray with black streaks (MnO) moist, v. stiff - CLAY TILL |
| | 20 | 20.0-20.0 | CME 5 | 5.0' | | As above, from 17.5'-20.0', increase in MnO and gravel, ~10% MnO more disseminated instead of streaks |
| 1830 | 25.0 | | | | | As above, damp, with pockets of increased sand and gravel |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task B52

Hole Number

TSA-6-1

Project:

TCF at the Chem. Plant

Location:

inside TSA, SE

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-8" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 2840 | | 25.0 | CME | | | | Fat Clay (CH), ~20% sand, ~10% fine to coarse gravel, mottled yellow brown, light gray and black (MnO), damp, V-stiff CLAY TILL |
| | | 28.5 | 6 | 5.0 | | | |
| 30 | | 30.0 | CME | | | | Fat Clay (CH) ~10% sand, minor fine gravel, mottled orange brown, light gray and black, massive, moist, very stiff Slickensided, FeO nodules. CLAY TILL |
| | | 30.0 | 7 | 5.0 | | | 30'-33' as above, reddish brown & light gray, FeO nodules, highly plastic |
| 35 | | 35.0 | SPT | | 32/6" | | Clayey gravel, limestone fragments up to 3", clay matrix highly plastic, light brown to black, moist Residual 35.0' |
| | | | | | | | Weathered limestone |
| 40 | | | | | | | T.D. 35.5', 0900, 2/10/99 Hole backfilled with Groot Well bentonite slurry |
| | | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number:
Task 852
Hole Number
TSA-6-2

| | | | |
|---|--|--|--|
| Project: <u>TCE at the Chem. Plant</u> | | Location: <u>inside TSA, SE</u> | |
| Coordinates: <u>1041449.67N 753920.54E</u> | | Drilling Contractor: <u>Geotechnology</u> | |
| Drill Make and Model: <u>CME-75 H.S. auger</u> | Depth Top of Rock: <u>34.0'</u> | Depth Casing & Size: <u>4 1/4" / 8 1/4"</u> | Hole Size: <u>4 1/4" / 8 1/4"</u> |
| Elevation: <u>664.80'</u> | Angle from Vert. and Bearing: <u>vertical</u> | Depth Bottom of Hole: <u>34.5'</u> | |
| Water Level: | Fluid & Additives: | Date Start: <u>1520</u> <u>2/9/99</u> | Date Finish: <u>1630</u> <u>2/9/99</u> |
| | | Loggers: <u>A. Benfer</u> | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|--------------|-------------------------------|--|--------------|--|
| | | INTERVAL | 30" TYPE & NUMBER RECOVERY | | | |
| | 0 | | CME 1 | 5.0' | | Fat Clay (CH), orange brown with minor light gray, massive, - 10% FeO nodules (1/4"), moist, very stiff, (Roxanna-like missing; cut?) <u>Ferrelview Clay</u> |
| 335 | 5 | 5.0 5.0 | CME 2 | 5.0' | | at 5', CH as above, mostly light gray with minor orange brown, FeO nodules, slickensided. |
| | 10 | 10.0 10.0 | CME 3 | 5.0' | | CH as above, trace sand and fine gravel, mostly gray with black streaks (MnO) slickensided at 14' increase in sand, ~10% basal Ferrelview |
| | 15 | 15.0 15.0 | CME 4 | 5.0' | | 15.0' Fat Clay (CH) ~ 20% sand, ~ 5% fine gravel, mostly yellow brown with light gray and black streaks (MnO) damp, v. stiff - poker chip texture <u>CLAY TILL</u> |
| 1610 | 20 | 20.0 20.0 | CME 5 | 5.0' | | As above, poker chips, mostly yellow brown, light gray seems to follow fractures (slickensides...) damp. |
| | 25 | 25.0 | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

Task B52

Hole Number

TSA-6-2

Project:

TCE at the Chem Plant

Location:

Inside TCA, SE

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6" 4" 6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CHE 7 | 5.0' | | | CH as above |
| | | 27.5 | | | | | |
| | | 30.0 | | | | | For CLAY (CH) trace sand, some FeO nodules, reddish brown with light gray or black following paleo. des- sication fractures. Moist, v. stiff, highly Plastic - CLAY TILL |
| | | 30.0 | | 4.0' | | | |
| | | 32.5 | | | | | |
| | | 34.0 | SPT | 34.6" | | | Clay on gravel, Clay matrix highly Plastic, light brown to black, moist dense, abundant MnO ₂ - Residuum. |
| | | 34.0 | | | | | Weathered limestone |
| | | 34.5 | | | | | T.D. 34.5 1630, 2/9/99 hole backfilled with Grout Well bentonite slurry |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:
Task 852

Hole Number:
TSA-G-3

Project: TCE at the Chem. Plant

Location: inside TSA, SE

Coordinates: 1041409.04 N 753933.60 E

Drilling Contractor: Geo technology

Drill Make and Model: CME-75 H.S. auger

Depth Top of Rock: 35.0

Depth Casing Size: —

Hole Size: 4 1/4" / 8 1/4"

Elevation: 664.25

Angle from Vert. and Bearing: Vertical

Depth Bottom of Hole: 35.5

Water Level: —

Fluid & Additives: —

Date Start: 12:50
2/9/99

Date Finish: 1:15
2/9/99

Logger: A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CME 1 | 50' | | | Fat Clay (CH) mottled orange brown + light gray, minor FeO nodules (~1/16") massive, moist, very stiff. (Roxanna-like missing, Ferrelview Clay probably cut area) |
| 5 | 50 | | CME 2 | 50' | | | Fat Clay (CH) as above, slickensided |
| 10 | 100 | | CME 3 | 50' | | | As above with trace of white angular sand grains, basal Ferrelview 12-14.5 mostly gray |
| 15 | 150 | | CME 4 | 50' | | | Fat Clay (CH) with ~15% sand, yellow brown with minor light gray and black streaks (MnO), moist very stiff. Some fine gravel. CLAY TILL. At 10'; increase in sand & gravel. |
| 20 | 200 | | CME 5 | 50' | | | Fat Clay as above, slight increase in sand and fine gravel, also MnO. CLAY TILL |
| 25 | 250 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:

TAG 852

Hole Number

TSA-6-3

Project:

TCE at the Chem. Plant

Location:

Inside TSA, SE

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS | SYMBOLIC LOG | SOIL DESCRIPTION |
|-----------|---------------------------|----------|------------------|----------|--|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 50' | | | Fat Clay as above. |
| | | 30.0 | | | | | at 28', Fat Clay (CH), reddish brown |
| | | 30.0 | CME 7 | 50' | | | with minor light gray, FeO nodules |
| | | | | | | | minor sand and gravel, some MnO |
| | | | | | | | streaks - CLAY TILL (Very similar |
| | | | | | | | to Ferrelview - 16 Clay Till). |
| | | 35.0 | | | | | Clay Gravel (GC) well graded, Clay CH, |
| | | | | | | | yellow brown to black, moist, dense |
| | | | SPT | 30/50 | | | Residual Limestones |
| | | | | | | | T.D. 35.5', 1415, 2/9/99 |
| | | | | | | | Hole back filled with |
| | | | | | | | Grout Well bentonite slurry |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2

Project Number:

TASK 852

Hole Number:

TSA-64

Project: TCE at the Chem Plant

Location: inside TSA

Coordinates: 1041399.07N 753933.60E

Drilling Contractor: Geotechnology

Drill Make and Model: CME-75 H.S. auger

Depth Top of Rock:

35.0'

Depth Casing & Size:

Hole Size:

4 1/4" / 8 1/4"

Elevation: 664.48'

Angle from Vert. and Bearing:

Vertical

Depth Bottom of Hole:

35.5'

Water Level:

Fluid & Additives:

Date Start: 0815

2/9/99

Date Finish: 1620

2/9/99

Logger:

A. Benfer

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|----------------------|----------|--|--------------|--|
| | | INTERVAL | 30" TYPE & NUMBER | RECOVERY | | | |
| | 0 | | CNE 1 | 5.0' | | | Fat Clay (CH), orange brown with minor light gray, some FeO nodules, moist, v. stiff, massive. Ferralview. Upper Ferralview missing. |
| 5 | 5.0 | | CNE 2 | 5.0' | | | As above 7.5'-10.0' - gray |
| 10 | 10.0 | | CNE 3 | 5.0' | | | Fat Clay, gray, trace white sand, trace fine gravel, moist v. stiff - Ferralview. |
| 15 | 15.0 | | CNE 4 | 5.0' | | | Fat Clay, ~20% well graded sand, ~10% fine gravel, yellow brown with some light gray & black (MnO) Moist, v. stiff, CLAY TILL |
| 20 | 20.0 | | CNE 5 | 5.0' | | | As above, slight increase in sand and gravel, gravel up to 1 1/2". increase in MnO. |
| 25 | 25.0 | | | | | | |

0900

0925



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2


Project Number: TALK 852

Hole Number: TSA-6-4

Project: TCE at the Chem Plant

Location: INSIDE TSA, SE

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-8"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|--------------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| | | 25.0 | CME 6 | 50' | | | Fat Clay (CH) pockets of well graded sand, some gravel, fine to 1". Zones of abundant FeO nodules, some MnO, yellow brown to reddish brown, moist, v. stiff. CLAY TILL |
| 0915 | 30 | 30.0 30.0 | CME 7 | 50' | | | Fat Clay (CH) reddish brown, minor light gray + black, ~ 15% sand & gravel, some FeO nodules, CLAY TILL |
| | 35 | 35.0 | | | | | 33.0' Gravelly Clay, yellow brown + black, highly plastic. Residuals - CH at 35', drove SPT to verify bedrock: SPT refusal, weathered limestone in top. |
| | 40 | | | | | | T.D. 35.5' 0920, Limestone bedrock. 2/9/99. Hole grouted with Grout Well bentonite slurry 1, 50# bag / 26 gals water |

| | | | |
|---|------------------------------|--|--------------------------------|
|  MORRISON KNUDSEN CORPORATION ENVIRONMENTAL SERVICES GROUP | | Sheet <u>1</u> of <u>1</u> Project Number: WP-476, Task 15 Hole Number: TSA6-5 | |
| BOREHOLE LOG | | | |
| Project: <u>TLE Source Investigation</u> | | Location: <u>SE CORNER OF TSA</u> | |
| Coordinates: <u>1041322.18N 753933.63E</u> | | Drilling Contractor: <u>GEDTECHNOLOGY</u> | |
| Drill Make and Model: <u>CME-55 ATV-MOUNT</u> | | Depth Top of Rock: <u>NA</u> | Depth Casing & Size: <u>NA</u> |
| Elevation: <u>666.59'</u> | | Hole Size: <u>8.5"</u> | |
| Angle from Vert. and Bearing: <u>VERTICAL (0°)</u> | | Depth Bottom of Hole: <u>28'</u> | |
| Water Level: <u>NA</u> | Fluid & Additives: <u>NA</u> | Date Start: <u>2/9/99</u> | Date Finish: <u>2/9/99</u> |
| | | Logger: <u>N. BOSS</u> | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 5"-5"-5" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|--|--------------|---|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | CME-1 | 3/3 | NA | | Boring collocated ~5' North of TSA6-6. Lithology/contacts were compared to TSA6-6 lith log. Lith contacts correlate exactly so description from TSA6-6 should be referenced for this boring. No odor present during sampling. |
| | 3 | | | | | | |
| | 3 | | | | | | |
| 5 | 8 | | CME-2 | 5/5 | NA | | |
| | 8 | | | | | | |
| | 10 | | | | | | |
| | 13 | | CME-3 | 5/5 | NA | | Samples collected in 1-gal Ziploc @ 2.5' intervals as composites for PID headspace analysis. |
| | 13 | | | | | | |
| 15 | 18 | | CME-4 | 5/5 | NA | | |
| | 18 | | | | | | |
| | 20 | | | | | | |
| | 23 | | CME-5 | 5/5 | NA | | |
| | 23 | | | | | | Boring backfilled w/ bentonite slurry upon completion. |
| | 23 | | | | | | |
| 25 | 28 | | CME-6 | 0/5 | NA | | Boring terminated @ 28' bgs due to loss of sampler. Hole was abandoned after numerous attempts to retrieve sampler when TSA6 sampler retrieved after removing entire string of TSA6. |
| | 28 | | | | | | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number:
WP-476, TASELS
Hole Number
TSA 6-6

| | | | |
|---|-----------------------|------------------------------------|-------------------------|
| Project: TLE SOURCE INVESTIGATION | | Location: SE CORNER OF TSA | |
| Coordinates: 1041316.97N 753934.44 | | Drilling Contractor: GEOTECHNOLOGY | |
| Drill Make and Model: CME-55 ATV MOUNT | | Depth Top of Rock: 36' bgs | Depth Casing & Size: NA |
| Elevation: 667.15 | | Hole Size: 8.5" | |
| Angle from Vert. and Bearing: VERTICAL (0°) | | Depth Bottom of Hole: 36' bgs | |
| Water Level: NA | Fluid & Additives: NA | Date Start: 2/8/99 | Date Finish: 2/9/99 |
| | | Logger: N. BOSS | |

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 0'-6"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------|----------|---------------|----------|---|--------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 0 | 0 | | CME-1 | 3/3 | NA | CL | (0-5) Silty CLAY; mottled rd brn; lt. gray; high plas; little silt; some clay; tr. of gty; field sand; v. stiff; tr. sub ang frag 1s gravel; damp; reworked (compacted); no odor; MnOx stain; FeOx nodules; [Ferrelview File] - from 4-5' - gray w/ sl odor (organic?) |
| 5 | 3 | | CME-2 | 5/5 | NA | CL | (5-15) Silty CLAY; mottled rd brn; lt. gray; high plas; little silt; some clay; tr. of gty; field sand; v. stiff; tr. sub ang frag 1s gravel; damp; no odor; MnOx stain; FeOx nodules; [Ferrelview (Native)] |
| 10 | 8 | | CME-3 | 3/5 | NA | CL | - decreasing mottling to gray only |
| 15 | 13 | | CME-4 | 5/5 | NA | CL | (15-33) Silty CLAY; rd. brn; med plas; some silt; some clay; little vt. gty; sub ang sand; tr. highly weathered granitic pebs; stiff; damp; no odor; MnOx stain; weathered [CLAY TILE] |
| 20 | 18 | | CME-5 | 5/5 | NA | CL | |
| 25 | 23 | | CME-6 | 5/5 | NA | CL | |
| | 28 | | CME-6 | 5/5 | NA | CL | |



MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2

Project Number:
WP476, Task 15

Hole Number
TSA6-6

Project: TRE SOURCE INVESTIGATION

Location: SE corner of TSA

| ELEVATION | DEPTH BELOW SURFACE | SAMPLE | | | STANDARD PENETRATION TEST RESULTS 6"-5"-6" (N) | SYMBOLIC LOG | SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol |
|-----------|---------------------------|----------|------------------|----------|---|-----------------|--|
| | | INTERVAL | TYPE & NUMBER | RECOVERY | | | |
| 25 | 23 | | CMG-6 | 5/5 | NA | | (15-33) See pg 1 for description |
| | 28 | | | | | | |
| | 28 | | | | | CL | |
| 30 | | | CMG-7 | 5/5 | NA | | |
| | 33 | | | | | | |
| | 33 | | CMG-8 | 3/3 | NA | GC | (33-36) Clayey (GEL) & white - H gray chert: Lo gravel (up to 3"); little v. fine; clay matrix is red brn; v. dense; clump; p. sorted; subang - subround gravel appear much weathered [Kashum] |
| 35 | 36 | | | | | | (36' Limstone; H gray (N6); sl. fossiliferous; sl. weathered; fine grained; high porous; high rec to Hcl; mod - hard [Barlington - Kashum]) |
| | | | | | | | Boring terminated @ 36' bgs due to refusal upon conformed bedrock. Boring backfilled w/ bentonite slurry. |
| 40 | | | | | | | - Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for on-site PID head space screening. |